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RADAR TARGET SCATTER SITE (RAT SCAT) BACKGROUND SUBTRACTION INVESTIGATION

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FOREWORD

This final report was prepared by Dr. Charles C. Freeny of General Dynamics Corporation, Fort Worth Division, Fort Worth, Texas, under Contract AF30(602)-3815, project number 6503, task number 650301. Secondary report number is FZE-615. RADC project engineer is Donald M. Montana (EMASP).

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ABSTRACT

The material presented herein are the results obtained from a program designed to investigate the feasibility of using vector subtraction to reduce ground clutter observed by VHF radars. The program was designed to obtain measured data with which to investigate the correlation of the phases and amplitudes of the background return as received from a dual receive antenna system.

A test program was conducted at the Radar Target Scatter Site (RAT SCAT) located near Holloman AFB in New Mexico. The program was conducted with the aid of the VHF feasibility demonstration system constructed under contract AF30(603)-3815. The tests were made using a frequency of 92.2 MH_z and the background region used in the investigation consisted of a mountain range located approximately 10 miles from the site. The test results were processed using a digital computer and then analyzed relative to the degree of phase and amplitude correlation which could be expected over a significant spatial region. In addition, an implementation method for real time vector subtraction technique in the area of static cross section measurements is discussed.

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EVALUATION

The underlying objective of this study was to determine the feasibility of adapting a form of background cancellation which had been successfully used at the Radar Target Scatter (RAT SCAT) Facility to the actual radar case. The demonstration took place at the White Sands Missile Range (WSMR) and was performed in the very high frequency (VHF) band. The possibility of success in this experiment was predicated upon the regularity of the structure of the surrounding mountainous terrain, a dearth of vegetation which otherwise would result in temporal fluctuation in radar ground clutter scattering, the very long wavelengths inherent in the VHF band, and the stability inherent in a coherent measurement system.

In spite of the high degree of coherency observed in the statistics of the ground clutter scatter data, the findings were not very encouraging for actual radar application. However, a new technique for reducing the backscatter clutter level on a static radar reflectivity range and having direct application to RAT SCAT resulted quite by accident. This will be discussed in more detail below.

The specific radar application for which this study was planned was the VHF modification of the AN/FPS-22 radar located at the WSMR which is currently underway at RADC in support of the SAMSO/ABRES System 627A. No further funded effort is contemplated. However, subsequent to completing the VHF modification but prior to the installation of a radar anti-clutter fence, further in-house tests in conjunction with Holloman Air Force Base personnel should be performed. Such tests would be more conclusive as they will make use of the final configuration of the modified AN/FPS-22.

The more rewarding aspect of this study embodied a method of background cancellation illustrated on page 10, figure 5 of the report. This resulted from an attempt to synthesize the condition where the target and the background were both observed in the normal radar beam and the background only was observed in a slave radar beam. Cancellation of background would then occur at rf in real time. Most of the complications inherent to the actual radar case which fortunately are of a diminished form on a static reflectivity range make this technique readily and easily implementable on any ground plane radar cross section range of which RAT SCAT is only one example. As there are no current requirements for improving the operational capability of RAT SCAT, no further R&D follow-on is planned.

Donald M. Montana
DONALD M. MONTANA
Project Engineer

SECTION 1

INTRODUCTION AND SUMMARY

1.1 INTRODUCTION

Ground clutter can result in a serious sensitivity reduction to radars operating at and below the VHF region. Techniques such as MTI and radar fences are currently being used to reduce this ground clutter in the case of dynamic measurement systems. In the case of static measurement systems such techniques as vector subtraction, and RF and IF cancellation have been used. Another technique for accomplishing this objective is discussed herein and involves the use of a slave receive antenna. The method is referred to as real time vector subtraction although the results of the measurement program are applicable to all types of coherent cancellation schemes. Results obtained during a recent VHF feasibility study (Contract No. AF30(602)-3815) indicated that vector subtraction would be feasible under certain restrictions on the properties of the ground clutter. Also, the technique has the advantage that it can be used in addition to other techniques such as MTI, and radar fences.

The primary purpose of this study was to investigate the variation and stability of ground clutter as produced by mountainous terrain as seen by a VHF radar system. This was accomplished by operating a coherent VHF radar system located at Holloman AFB in which the amplitude and phase of the ground clutter was measured as a function of range, angle of separation between the transmitter antenna and the slave antennas, polarization and time. In Figure 1, the mountainous region which produced the clutter return used in this study is depicted.

In Section 2 a description of the measurement and analysis technique are described along with representative measured and computed results.

1.2 Summary

In Section 2 typical experimental results are presented which were obtained by measuring the amplitude and phase received from a transmit antenna and that measured subsequently from a slave antenna. Amplitude and phase data was obtained as a function of range over a 30,000 foot section of mountainous terrain located approximately 60,000 feet from the antennas. In addition, the

Fig. 1 MEASUREMENT TERRAIN

angular separation between the transmit and slave antennas was varied in four (4) degree azimuth increments over a ±20 degree sector and in 20 degree elevation increments over a ±20 degree sector. The measurements were made using a 1000 foot transmitter pulse length and a range gate width of 500 feet. Data was obtained for the cases of horizontal and vertical polarizations and repeated four times over a four-day period. Throughout the measurement program the transmit antenna remained fixed in order to maintain a phase and amplitude reference. However, some long term drift was inherent in the measurement system due to the change in the time delay unit between the transmitter and receiver.

Before summarizing the results of the measurement program the relationship of the measurement system parameters such as antenna beam width, clutter cross section level and operating frequency to other VHF systems should be noted. The antenna system used to obtain the data was a yagi design and each of the antennas had a beam width of approximately 50 degrees and a gain of approximately 10 db relative to an isotropic radiator. Hence the angular separation between the slave and transmit antenna which was used in the program corresponded approximately to one beam width. To extrapolate the information obtained in this study to other antenna designs, the angular sector should be limited to less than the beam width of the antenna.

The clutter cross section level which was involved in this measurement program was in the range of 20 to 75 dBsm depending on the polarization and range. These values were computed based on the calibrated data obtained during the VHF feasibility demonstration program reported in Reference 1. During that program the operating range was 1500 feet and at this range the system noise levels, operating at 92.2 MHz, were found to be -35 dBsm in vertical polarization and -45 dBsm in horizontal polarization. During the program being reported the operating range was 60,000 to 90,000 feet and the system noise level corresponded to 10 on the recorder scale. Based on this information the above indicated values for the clutter cross section can be computed and indicates the need for techniques of reducing the clutter in amounts up to 50 db.

A method for extrapolating the results of this program to systems operating at a higher or lower frequency cannot be demonstrated in general. However, assuming that the frequency to which the data is to be extrapolated is not too great (less than 3 times that used in this study) a reasonable approximation to the differential phase data obtained in this program as a function of range, would be to multiply this data by the ratio of the new frequency to 92.2 MHz.

A summary of the degree of spatial correlation achieved during this study is presented in Figures 2 and 3. In Figure 2 the rate of change of the amplitude and phase differential between the transmit and slave antenna is depicted. The data presented in the figure was obtained by averaging the differential data obtained in each of the four measurement sequences in the regions where the signal-to-noise was sufficient to allow consistent data to be obtained and at selected ranges covering the region investigated. Also, at ranges where the data was changing very rapidly (68k and 73k feet) two range bins were averaged together in order to remove wide variations caused by the measurement system. The data spread caused by elevation is also indicated on each of the graphs (amplitude and phase) and this was obtained by comparing the differential data as a function of elevation angle. The data shown in Figure 2 is for the case of horizontal polarization and that in Figure 3 for vertical polarization. The data in Figures 2 and 3 show the magnitude of the changes in amplitude and phase data in the case of horizontal and vertical polarizations are approximately the same, but the direction of the changes are different. In both cases, the change in differential amplitude as a function of the range indicates that the terrain observed is distributed over a wide angular region. That is, since the transmit antenna was fixed the change in differential amplitude (and phase) as a function of azimuth was due to the slave antenna pattern.

The magnitude of the changes between the slave and transmit amplitude nd phase data indicated in Figures 2 and 3 indicate that there is sufficient correlation to allow a real time vector subtraction system to be implemented with which a substantial amount of background reduction could be realized. (See Section 3 for other considerations.) For example, the rate of change of phase and amplitude (typical cases shown are less than 1 db and 5 degrees per thousand (k) feet) indicates that if perfect cancellation was achieved at a given range then approximately 20 db of cancellation (see Equation 1) would still be realized at ranges $\pm$1000 feet on either side of the optimized range (this notch would be wider if a longer pulse length was used). Hence, if a programmed feedback network was incorporated between the slave and transmit antenna which was centered about and designed to track the range gate of the main radar receiver, a "notch" approximately 2000 feet wide could be created. The degradation of this optimum cancellation due to angular misalignment could be overcome by slaving the slave antenna to the transmit antenna. However, another source of degradation which will occur due to the time stability of the system will limit the amount of "perfect" cancellation which can be achieved.

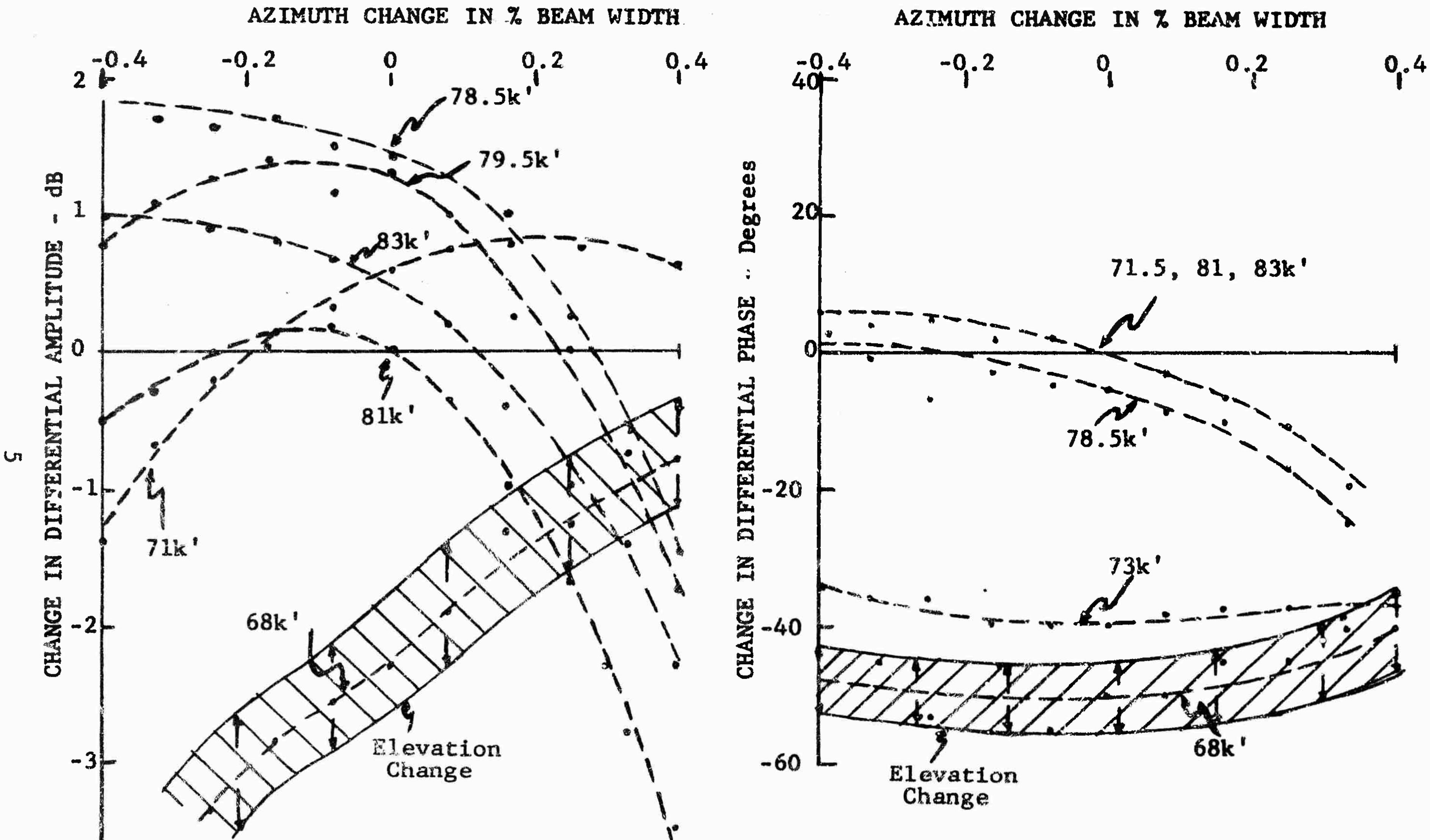


Fig. 2 SPATIAL CORRELATION (HOR POL)

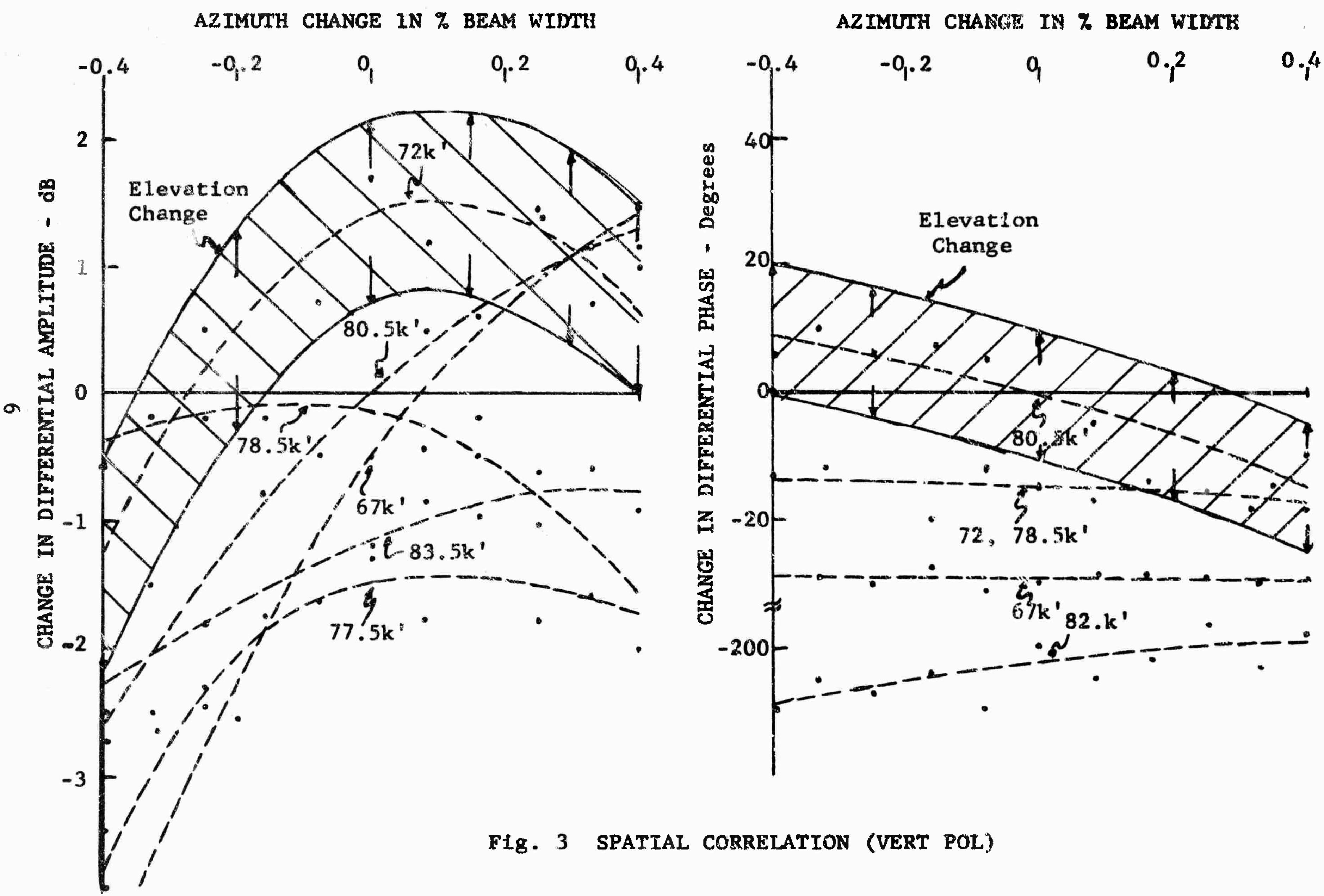


Fig. 3 SPATIAL CORRELATION (VERT POL)

Changes as a function of time can occur due to change in the system parameters associated with the antennas and frequency or with changes in the background characteristics such as might be caused by moisture changes. During this measurement program no noticable changes in the background characteristics were observed although no significant changes in the weather occurred during the measurement series. System stability was evaluated by observing the changes in differential data obtained over a relatively long time period. The results of these tests are presented in Figure 4 which depicts the amplitude and phase stability as a function of signal-to-noise. The solid lines represent data obtained in this program by comparing the change which occurred in the differential data between measurement sequences. There was some long term drift in the time delay unit which allowed a certain amount of decorrelation between the range bins associated with the different measurement sequences. However, these shifts could usually be observed by noting where the maximum amplitudes occurred in terms of range. When this occurred the data was realigned to obtain the stability information presented in Figure 4 (in cases where range bin decorrelation was substantial time and measurement stability data was obtained by computing the differential between sets of data recorded using the transmit antenna). Also shown in Figure 4 is short term stability information which was obtained by averaging the change in the transmit antenna return over a measurement series. The dashed lines shown in Figure 4 are extrapolations of the measured data into regions of higher signal-to-noise using the slope of the line generated with measured data.

To convert the differential data (in decibels) to the clutter reduction levels depicted the equation developed in Reference 2 was used. This expression is noted in Equation 1 and gives the amount of clutter reduction achievable given the variance of the amplitude ($1-\alpha$) and phase ($\Delta\emptyset$). To arrive at the data in Figure 4 it was assumed that the amplitude and

$$R = (1 - \alpha)^2 + 4\alpha \operatorname{Sin}^2 \frac{\Delta\emptyset}{2} \qquad (1)$$

phase variances were parti lly independent (i.e., the clutter reduction due to phase variance and amplitude variance were computed separately and the results added). Again, the dashed line is data extrapolated into a region of higher signal-to-noise using the intersection of the slopes of the long term

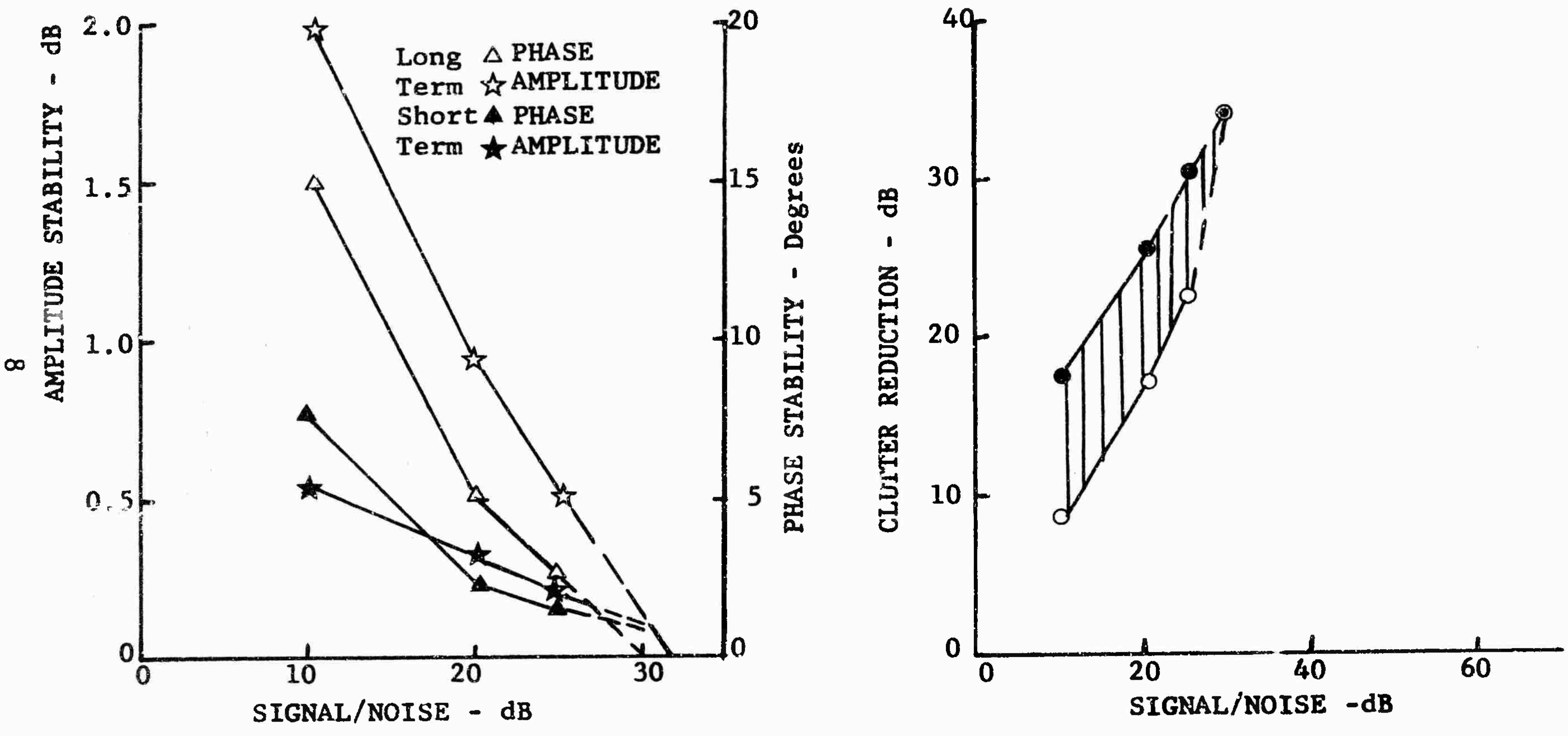


Fig. 4 STABILITY AND CLUTTER REDUCTION ESTIMATE

and short term data. In the case of complete amplitude and phase correlation the clutter reduction will be less than indicated in Figure 4 (for the worst case condition the amount will be 3 db).

In summary the results obtained in this program indicate that a real time vector subtraction technique or standard vector subtraction technique is feasible in the VHF region for the case of a static radar system (Reference 2 for the non-real time technique applied to the static case). To implement the technique in a dynamic system, the results of this program indicate that the operational feasibility will depend on the extent of the background region (e.g., when background return involves several side lobes) and the rate at which the phase and amplitude of the feedback loop must be changed. For example, if the range gate is being changed at a rate of 1000 feet per second then the results shown in Figures 3 and 4 indicate that the rate of phase change is on the order of 5 degrees per second and that of amplitude 1 dB per second (a notable exception occurs in vertical polarization phase at a range of 82.5K feet). However, if the target speed is 10,000 feet per second the phase system must be capable of changing 50 degrees/sec and 10 dB/sec in a stable manner. Although this is an order of magnitude slower than the current RAT SCAT system, based on the above discussion and the results of this study the gain in clutter reduction with a dynamic system appears to be marginal (10 to 20 dB) relative to that which can be achieved by doppler processing and/or clutter fences.

In the case of a static measurement system, problems associated with angular tracking and range changes are essentially eliminated. Hence, the technique could afford a very reliable method for maintaining background cancellation over a long time period even at the higher frequencies, since the normal problems of frequency and mechanical stability of the background are inherently eliminated with the slave antenna approach (although time side lobes could be a problem if the pulse length is too short). In Figure 5 the technique is illustrated in conjunction with its' application to static measurements on a ground plane cross section range. The slave antenna is placed above the transmit receiver with the proper phase and amplitude to cancel the target support as seen by the transmit receive antenna. Since the target return as seen by the slave antenna will be considerably lower than as seen by transmit (typical nulls are in the range 20 dB one way) the signal being subtracted from the target plus background is only the background signal.

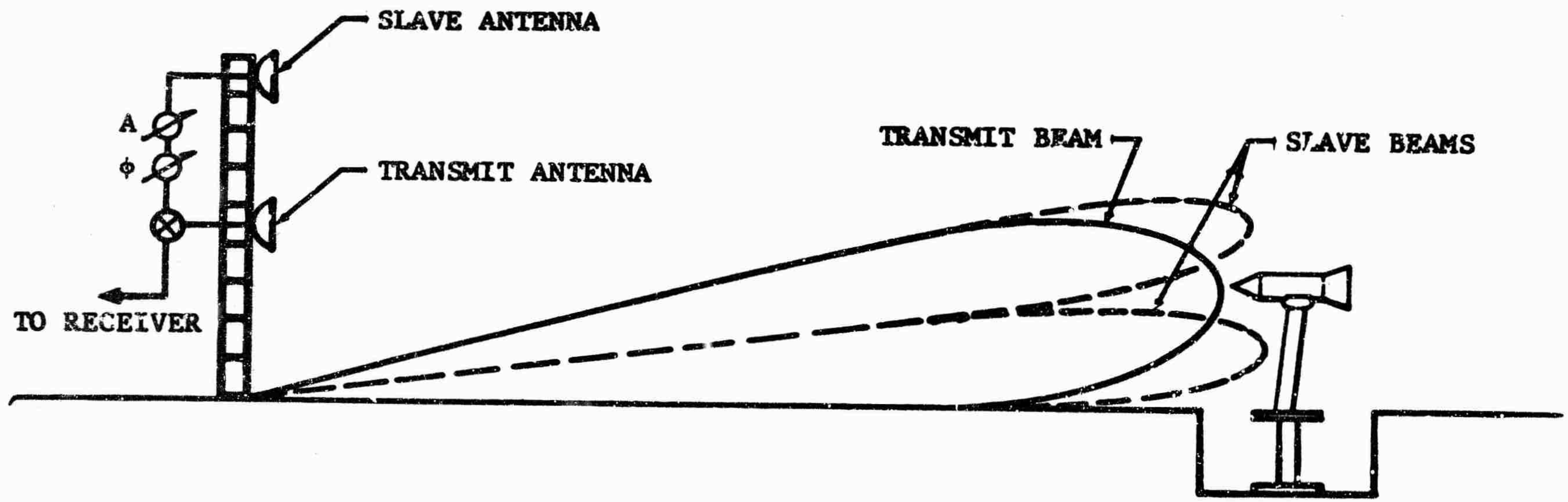


Fig. 5. APPLICATION TO STATIC MEASUREMENTS

SECTION 2

MEASUREMENT SYSTEM AND RESULTS

2.1 GENERAL

The Vector Subtraction measurement program was conducted at the RAT SCAT facility located near Holloman AFB, New Mexico. The measurements were made using a coherent radar system developed under the VHF feasibility program contract AF30(602)-3815. The data was analyzed at the Fort Worth Division of General Dynamics with the aid of an IBM 7040-7090 digital computer system and SC 4020 automatic plotter. The measurement system and measurement technique are described in this section along with the computer program used to process the raw data. In conclusion, representative measured and computed data are presented.

2.2 Measurement System

The Measurement system used to obtain the data is illustrated in Figure 6. The basic system components consisted of three antennas, a coherent transmitter designed to operate between 30 and 100 MHz, a receiver using a 15 MHz IF system, an amplitude and phase console, and a digital recording system to measure amplitude, phase, and range. A detailed description of the electronic system is given in Reference 3 and the basic properties are summarized in Table 1.

The tests were conducted a a frequency of 92.2 MHz and the major modifications of the VHF stem which were incorporated to perform the vector subtraction udy were that of a range gate control circuit and a method for adjusting the pointing angle of the slave antenna.

A range gate control circuit was incorporated which would effectively allow the range gate to be adjusted in steps of 500 feet over a span of 30,000 feet. The amplitude and phase were measured with the aid of a reference pulse which was gated into the system at a time when no targets were present. A schematic of the timing circuit along with the relative positions of the reference e and target gate are illustrated in Figure 7.

The antenna control systemis illustrated in Figure 8. A closed loop pulley system was used to adjust azimuth angle of the slave antenna and the elevation angle was adjusted by using fixed marks on the antenna tower where the base plate is attached. The azimuth servo was calibrated in two degree increments over a range of ±20 degrees with the aid of a compass and pointer attached to the base

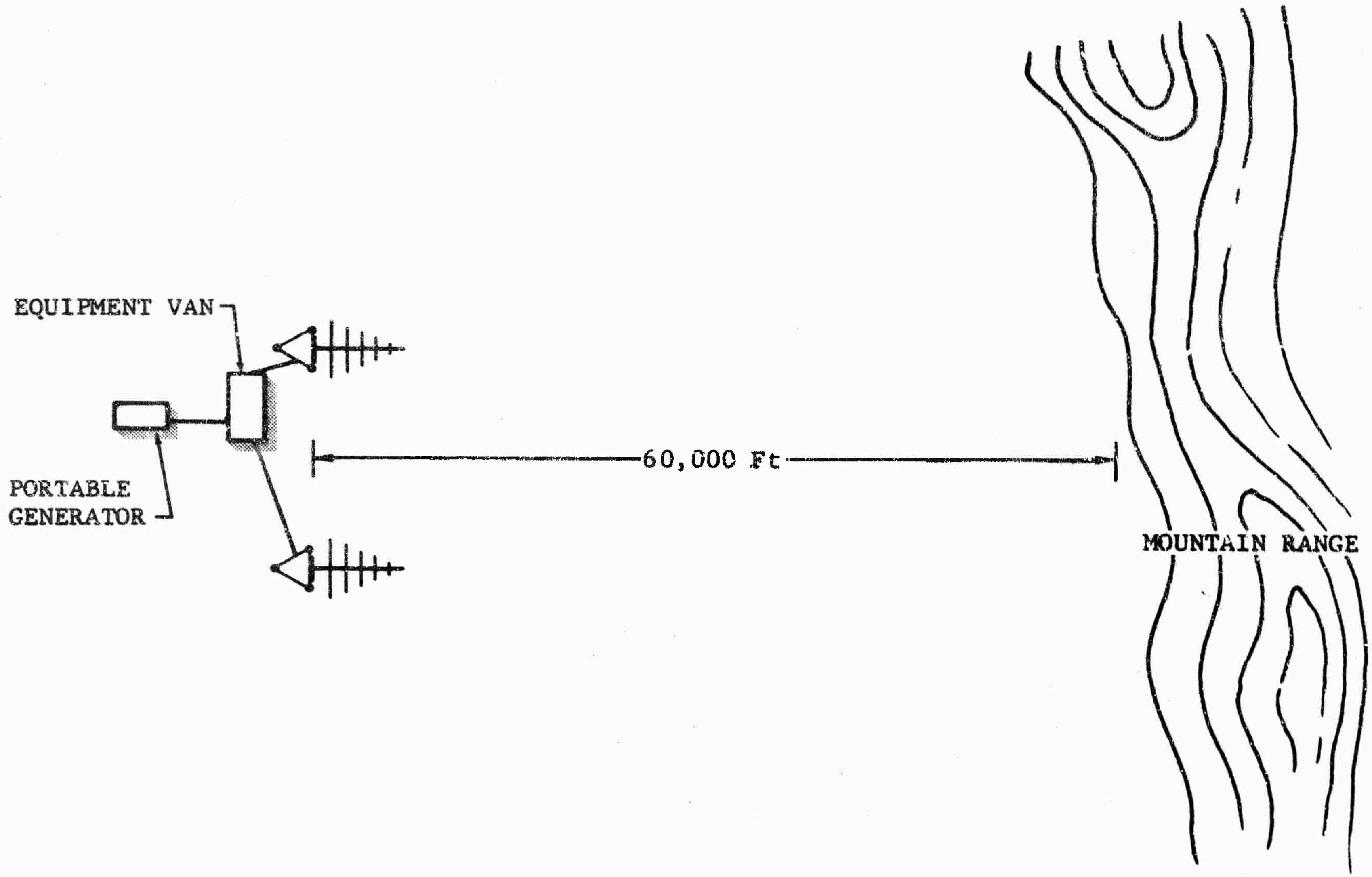


Fig. 6 VECTOR SUBTRACTION MEASUREMENT SYSTEM

Table 1 MEASUREMENT SYSTEM CHARACTERISTICS

Transmitter	
Frequency	30-100 MH_z
Peak Power	200 Watts
PRF	5 KH_z
Pulse Width	0.5 to 50 usec
Interpulse Noise	-120 dB
Intrapulse Noise	-80 dB
Frequency Stability	1 part in 10^7/10 minutes
Amplitude Stability	$\pm$ 0.25 dB
Receiver	
Frequency	30-100 MH_z
IF Bandwidth	0.2, 0.5, 2 MH_z
Noise Figure	6 dB
IF Frequency	15 MH_z
Dynamic Range	50 dB (Limited by recorder)

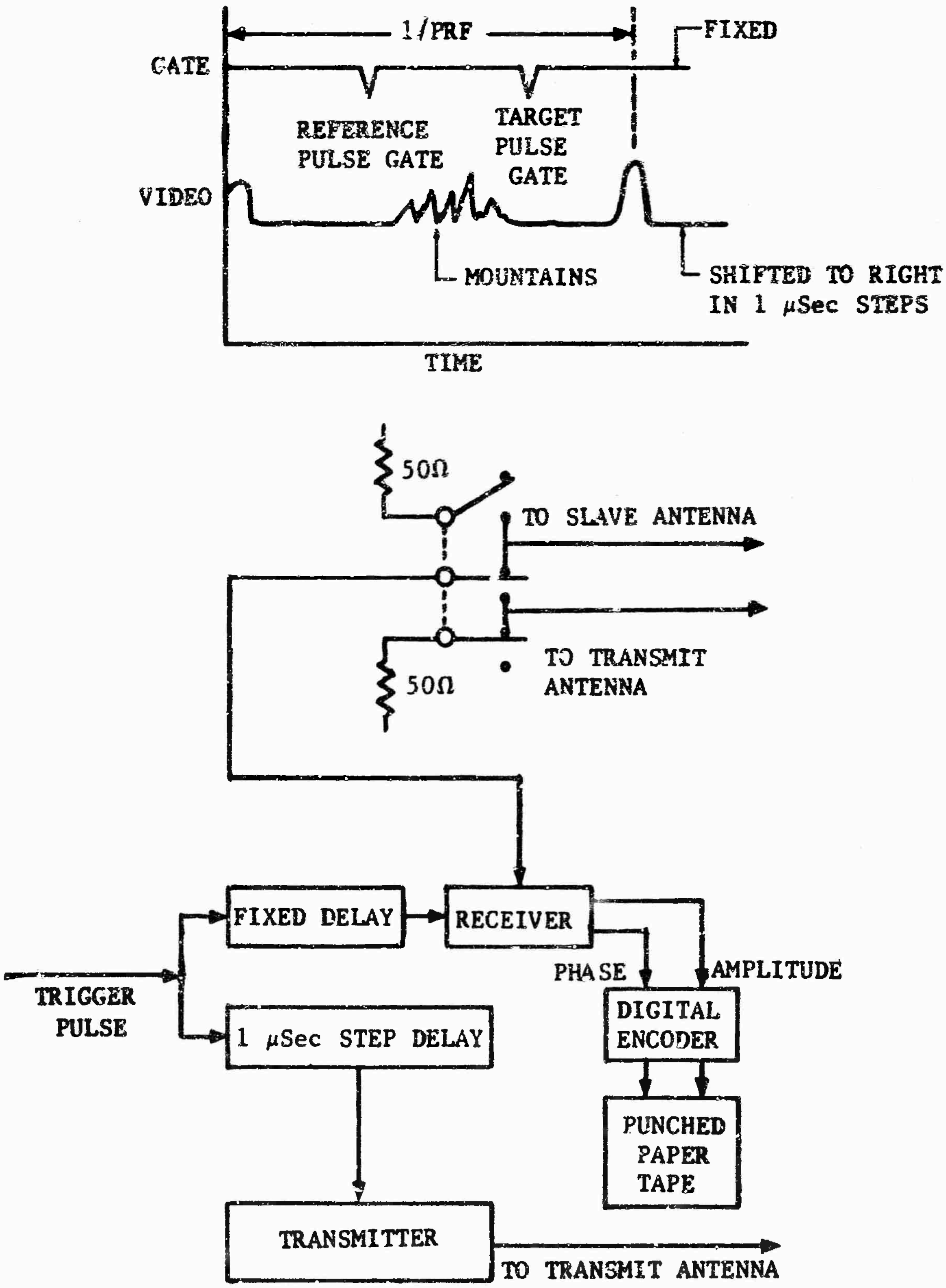


Fig. 7 RANGEGATE CONTROL & MEASUREMENT TECHNIQUE

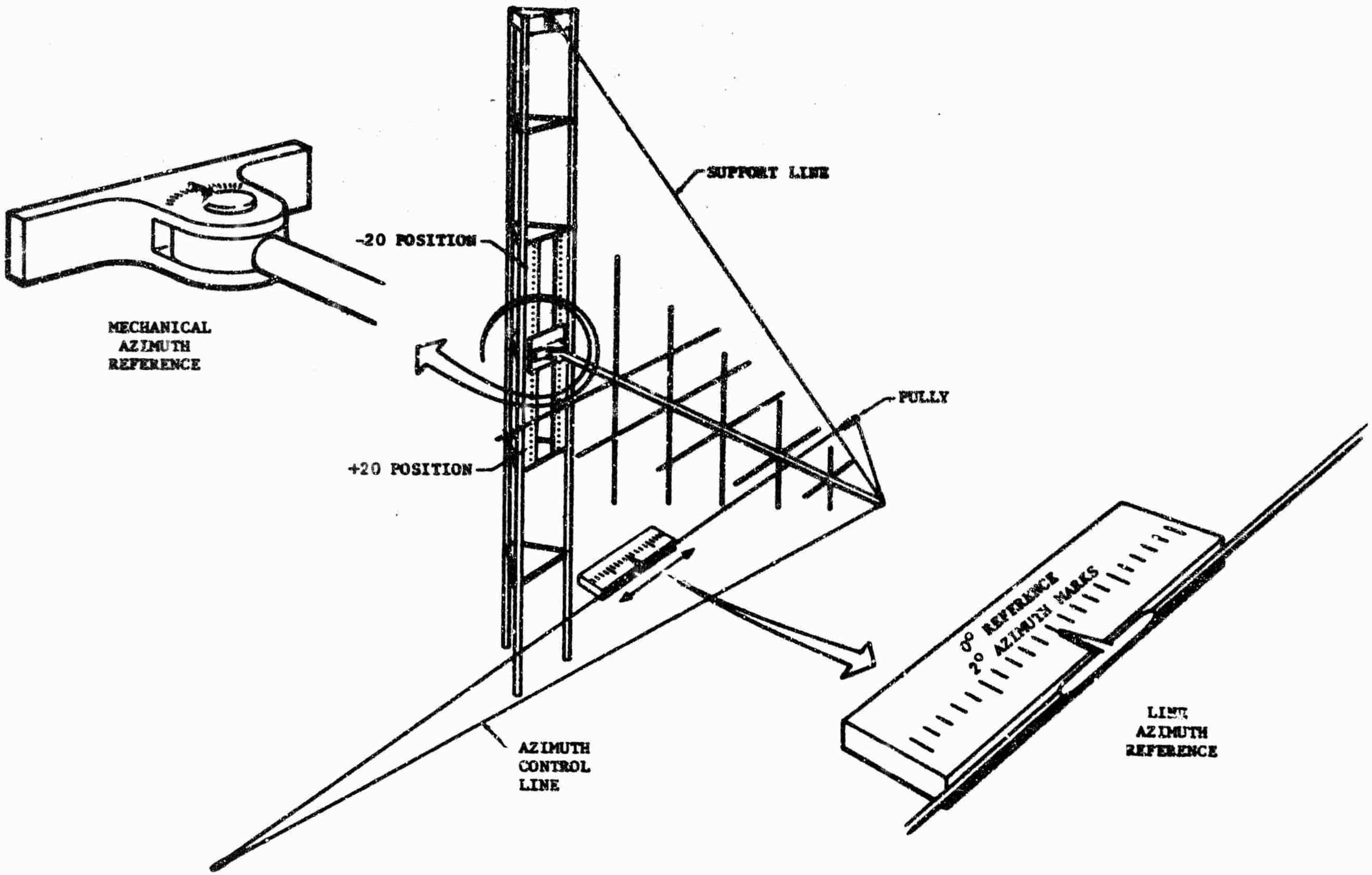


Fig. 8 ANTENNA CONTROL SYSTEM

plate and antenna respectfully. The technique illustrated allowed the azimuth reference to be maintained by periodically checking the zero azimuth reference on the control rope with the mechanical zero azimuth reference of the antenna compass-pointer system.

2.3 Measurement Technique

The measurement system described in 2.2 was used to obtain amplitude and phase data over a space envelope convering 30,000 feet span in range and a 40 degree elevation and azimuth sector. In order to obtain a representative set of data with which to evaluate the amplitude and phase variation of this space envelope, the measurements were repeated four different times at each of vertical and horizontal polarizations. Each set of measurements consisted of (1) recording the amplitude and phase every 500 feet over a 30,000 foot range span at fixed positions of the transmit and slave antennas, (2) repeating this step at 4 degree intervals of slave antenna azimuth position over a range of ± 20 degrees and (3) repeating steps (1) and (2) at slave antenna elevation positions of -20, 0 and +20 degrees. During the above described measurement sequence the transmit antenna was fixed in position to maintain a phase and amplitude reference. The relative positions of the transmit and slave antenna were 50 feet and 25 feet respectively. Considering the case where the elevation angle was zero for both antennas, the heights indicated above would place the center of the slave antenna at twice the height of the transmit antenna. This method along with the azimuth and elevation adjustments, was used to simulate the condition that the slave antenna be in the sidelobe of the transmit antenna.

The measurements were made using a pulse length of 1000 feet and since data was recorded every 500 feet, the number of range resolution cells involved in the range span was 30. The signal-to-noise ratio associated with the data varied between less than 0 db to 30 db and the return signal as a function of range was typical of mountainous regions in that it was quite irregular. At range positions where the signal-to-noise was greater than 15 db, (25 on the recorder scale) the stability of the electronic system was sporadically poor.

2.4 Analysis Technique

The data obtained under the measurement conditions described in 2.3 was recorded on punched paper tape and subsequently transferred to magnetic tape for processing in an IBM 7090-7040 computer. In order to evaluate the variation between the transmit

antenna and slave antenna as a function of angular separation and range, the amplitude and phase data recorded for these antennas was subtracted in corresponding range bins for each of the measurements conditions. Also, the actual recorded data was listed in terms of the measurement conditions (1) polarization (2) day of measurement (3) antenna type and (4) azimuth position. A sample of the computer output is shown in Figures 9 and 10. In Figure 10 the column headings DA and DPHI represent the absolute values of the differential amplitude and differential phase (mod 2π) between the data recorded using the transmitter and slave antenna. Each line of the computed data is for a range gate position shifted 500 feet. The data is ordered such that the first line represents data at the maximum range (90,000 feet).

In addition to the tabulated data, the computer program was also designed to allow the data to be plotted using an SC 4020 plotter. The plot routine was designed to provide separate plots of phase and amplitude for a selected span of azimuth valves (up to four curves (azimuth valves) per plot). Shown in Figures 11, 12 and 13 are typical plots for the case of transmit antenna, slave antenna, and the differential information respectively. The three sets of curves represent azimuth angles of -20, -16, and -12 degrees (labeled A, B, C). For the sake of clarity, a constant value of 2 dB and 10 degrees in phase was added to the respective curves to separate the consecutive azimuth cirves, (e.g., 2 dB is added to curve B, 4 db to curve C, etc.). When data points are larget than the maximum ordinate value on the plot, the point is plotted below the abcissa. To obtain an absolute reference for the clutter return the dBsm valve corresponding to zero of the plot scale (for curve A) is noted on each plot and refers to the valve at a range of 60,000 feet.

2.5 Measured and Computed Data

The technique described in 2.4 was used to record and present the measured and computed data. Selected data is presented in Figures 14 through 49 which represent the basic results obtained during this program. Although space would not allow all of the data to be presented, the data presented is typical and represents data obtained at each of the antenna angular positions and polarizations.

In Figures 14 through 31 measured and computed data for horizontal and vertical polarizations are presented in tabular form. The data is for the case of the fourth series of measurements (day 4) and the data is grouped in the order of transmit antenna, slave antenna and differential data.

I N P U T   D A T A

DAY NUMBER- 3   POLARIZATION- VERT   ELEVATION- -20

TRANS ANTENNA 60 RANGE VALUES

-20.		-16.		-12.		-8.		-4.		0.		4.		8.		12.		16.		20.	
SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE
26.0	338.	25.6	340.	25.5	350.	25.5	348.	25.1	350.	23.9	351.	25.2	357.	25.9	355.	27.2	357.	25.2	4.	12.6	319.
29.4	17.	27.6	12.	26.5	22.	25.4	14.	25.9	20.	23.8	22.	24.5	10.	25.2	23.	24.4	9.	24.3	24.	25.3	32.
13.0	333.	15.6	333.	14.5	340.	12.6	329.	13.1	326.	13.1	307.	20.4	300.	18.4	311.	19.8	310.	19.2	317.	24.5	344.
22.4	300.	23.0	311.	21.8	309.	20.3	311.	20.8	310.	20.0	297.	20.5	297.	21.0	308.	20.6	302.	21.4	310.	21.5	324.
18.7	297.	20.0	302.	18.8	304.	19.2	308.	19.1	314.	15.7	297.	19.5	302.	20.2	308.	19.3	302.	19.5	315.	19.5	316.
24.2	322.	25.0	325.	23.7	330.	23.8	331.	22.7	336.	21.1	322.	22.8	328.	23.0	331.	21.3	324.	23.4	332.	21.3	340.
25.1	335.	24.4	341.	23.5	345.	23.9	345.	22.5	349.	22.2	345.	20.7	339.	22.8	349.	20.4	338.	23.4	352.	20.8	346.
0.1	12.	0.1	12.	0.1	10.	0.2	347.	0.6	320.	11.5	352.	8.1	206.	4.8	230.	9.6	262.	4.4	268.	13.9	282.
0.1	156.	0.2	155.	0.1	154.	1.1	150.	2.3	218.	12.3	247.	15.6	173.	14.2	186.	12.2	188.	7.1	195.	14.9	214.
0.6	196.	0.2	184.	0.7	185.	5.9	188.	6.9	214.	11.2	191.	15.1	193.	10.5	206.	13.6	198.	10.9	200.	16.9	217.
0.1	264.	0.2	260.	0.1	261.	0.2	257.	1.0	278.	0.2	226.	8.6	216.	0.5	240.	2.0	232.	0.8	228.	6.3	236.
1.6	214.	3.8	215.	3.3	213.	3.2	210.	7.0	212.	12.0	200.	15.5	213.	12.7	217.	14.5	210.	10.8	221.	14.2	246.
25.6	216.	28.8	222.	27.2	221.	26.7	226.	27.1	225.	26.9	218.	27.8	230.	27.2	229.	26.8	226.	27.2	226.	27.2	244.
31.4	224.	29.8	233.	32.3	226.	31.7	229.	31.0	233.	28.8	232.	32.3	229.	0.	0.	32.1	229.	31.6	227.	34.4	260.
24.1	242.	26.1	242.	27.2	240.	23.2	248.	0.	0.	23.2	245.	25.8	241.	24.3	248.	26.4	245.	25.7	242.	27.4	260.
15.1	279.	16.7	285.	15.2	283.	15.2	286.	13.9	283.	15.4	274.	17.5	260.	15.6	280.	16.8	276.	15.7	277.	15.1	276.
9.6	286.	9.9	280.	10.2	285.	9.0	283.	10.1	272.	9.3	258.	13.0	253.	13.2	271.	14.2	276.	13.7	270.	16.1	288.
7.0	251.	8.9	253.	9.2	254.	9.5	254.	8.7	244.	11.6	229.	15.9	233.	13.7	245.	13.9	244.	14.8	253.	15.3	275.
5.5	244.	9.8	241.	11.4	244.	8.7	240.	9.8	238.	12.0	220.	15.1	221.	14.6	227.	13.4	230.	13.9	233.	15.9	260.
0.1	231.	3.1	223.	2.6	224.	4.6	232.	5.7	214.	10.1	198.	13.5	194.	13.4	210.	9.2	203.	10.2	209.	14.8	232.

SLAVE ANTENNA 60 RANGE VALUES

-20.		-16.		-12.		-8.		-4.		0.		4.		8.		12.		16.		20.	
SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE
15.6	301.	19.0	300.	25.0	317.	25.6	310.	28.7	315.	30.9	326.	28.4	324.	28.7	328.	29.0	327.	29.7	1.	30.1	3.
21.6	304.	25.3	317.	24.7	318.	27.4	321.	29.8	324.	32.0	330.	31.2	350.	31.2	4.	31.7	4.	30.8	27.	20.9	22.
18.4	282.	22.1	296.	23.2	314.	22.0	317.	24.4	320.	27.5	334.	22.8	328.	23.9	332.	24.7	334.	25.1	358.	25.0	355.
20.4	306.	22.3	290.	23.2	317.	23.7	322.	23.6	309.	26.3	334.	21.7	318.	22.2	317.	22.2	322.	22.0	333.	22.7	335.
22.8	338.	21.1	330.	23.6	341.	23.6	328.	19.5	316.	27.1	344.	17.4	314.	17.4	286.	15.8	296.	15.8	307.	15.5	300.
17.4	352.	21.7	4.	21.9	359.	17.1	300.	18.6	302.	26.3	337.	21.2	336.	20.7	282.	20.9	290.	23.5	308.	22.8	336.
22.4	93.	10.5	354.	19.7	346.	17.1	304.	22.3	312.	28.1	332.	23.0	318.	23.5	302.	24.8	310.	25.2	318.	24.8	321.
13.4	342.	18.3	348.	22.9	352.	24.9	1.	27.7	353.	26.6	354.	23.2	10.	24.0	14.	24.2	10.	21.4	331.	21.9	358.
21.4	342.	22.7	349.	22.7	359.	23.9	7.	26.0	346.	23.9	21.	27.7	34.	26.6	64.	27.1	62.	8.8	160.	26.6	85.
21.3	349.	23.4	350.	22.5	3.	18.0	14.	1.6	70.	6.7	36.	0.1	122.	27.8	38.	27.6	51.	13.4	152.	26.2	95.
20.8	1.	21.0	5.	19.7	7.	15.3	355.	0.1	125.	30.7	80.	0.9	184.	12.6	296.	12.2	298.	12.9	206.	15.6	290.
0.1	119.	0.1	128.	0.1	139.	0.1	144.	2.6	146.	10.7	100.	3.4	174.	14.6	172.	15.8	175.	22.2	197.	19.8	198.
0.3	128.	1.8	130.	1.3	142.	3.6	142.	29.4	122.	4.4	154.	31.0	164.	31.5	153.	36.0	166.	32.8	210.	32.7	211.
0.3	140.	29.2	118.	31.2	125.	33.0	133.	33.3	138.	32.7	160.	32.2	165.	34.7	168.	28.0	156.	33.1	218.	34.2	218.
0.1	198.	11.9	312.	16.6	306.	32.7	22.	28.1	134.	26.0	323.	31.7	94.	27.6	160.	23.8	133.	26.1	230.	26.0	228.
7.5	263.	21.6	341.	21.9	346.	22.3	342.	21.4	334.	26.9	349.	15.5	337.	19.1	327.	20.1	338.	14.0	284.	11.9	278.
10.8	28.	21.5	358.	20.7	4.	20.5	354.	19.5	348.	24.5	359.	14.7	346.	12.4	312.	10.9	283.	12.9	265.	12.7	254.
13.8	11.	8.9	26.	5.4	37.	14.6	357.	13.4	337.	13.7	358.	10.5	87.	0.6	276.	9.2	204.	14.5	211.	15.7	210.
8.3	78.	0.1	86.	0.2	102.	0.1	92.	0.1	87.	0.1	96.	0.1	166.	0.1	210.	4.9	166.	15.0	206.	13.9	190.
0.1	94.	0.6	102.	0.8	111.	0.1	110.	0.1	126.	0.1	123.	0.1	152.	0.4	155.	0.7	114.	6.9	171.	7.1	169.

Fig. 9 MEASURED DATA PRINTED FORMAT

C O M P U T E D   D A T A

DAY NUMBER- 3   POLARIZATION- VERT   ELEVATION- -20

-20.		-16.		-12.		-8.		-4.		0.		4.		8.		12.		16.		20.	
DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI
10.4	37.	7.6	40.	0.5	33.	3.1	38.	3.6	35.	7.0	25.	3.2	33.	2.8	27.	1.8	30.	4.5	3.	17.5	44.
7.8	73.	2.3	55.	1.8	64.	2.0	53.	3.9	56.	8.2	52.	6.7	20.	6.0	19.	7.3	5.	6.5	2.	5.6	10.
5.4	51.	6.5	37.	8.7	26.	9.4	11.	11.3	6.	14.4	27.	2.4	28.	5.5	21.	4.9	24.	5.9	41.	0.5	11.
2.0	6.	0.7	21.	1.4	8.	2.9	11.	2.8	1.	6.3	37.	1.2	21.	1.2	9.	1.6	20.	0.6	23.	1.2	11.
4.1	41.	1.1	28.	4.8	37.	4.4	20.	0.4	2.	11.4	47.	2.1	12.	2.8	22.	3.5	6.	3.7	8.	4.0	18.
6.8	30.	3.3	39.	1.8	20.	6.7	31.	4.1	34.	5.2	15.	1.6	22.	2.3	49.	0.4	34.	0.1	24.	1.5	34.
2.7	118.	13.9	13.	3.8	1.	6.7	41.	0.2	37.	5.9	13.	2.3	21.	0.7	47.	4.4	28.	1.8	34.	4.0	25.
13.3	30.	18.2	24.	22.8	18.	24.7	14.	27.1	33.	15.1	2.	15.1	164.	19.2	144.	14.6	108.	17.0	63.	8.0	76.
21.3	174.	22.5	156.	22.6	155.	22.3	143.	23.7	128.	11.6	134.	11.1	139.	12.4	122.	14.9	126.	1.7	35.	11.7	129.
20.7	163.	23.2	172.	21.8	178.	12.1	174.	5.3	144.	4.5	155.	16.3	71.	17.3	166.	14.0	147.	2.5	48.	9.3	121.
20.7	97.	20.8	106.	19.6	106.	15.1	99.	0.9	153.	30.5	146.	7.7	32.	12.1	56.	10.2	66.	12.1	22.	9.3	54.
1.5	95.	3.7	88.	3.2	74.	3.1	66.	4.4	66.	1.3	130.	12.1	39.	1.9	45.	1.3	43.	11.4	24.	5.6	48.
26.3	88.	27.0	84.	25.9	79.	23.1	84.	2.3	103.	22.5	64.	3.2	86.	4.3	76.	9.2	60.	5.6	16.	5.5	33.
31.1	84.	0.6	115.	1.1	101.	1.3	96.	2.3	95.	3.9	92.	3.1	64.	34.7	168.	4.1	73.	1.5	9.	1.8	42.
24.0	54.	14.2	73.	10.6	66.	9.5	134.	28.1	134.	2.8	78.	4.9	147.	3.3	88.	2.6	112.	0.4	12.	0.6	38.
7.6	16.	4.9	55.	6.7	63.	7.1	56.	7.5	51.	11.5	75.	1.1	77.	3.5	47.	3.3	62.	1.7	7.	4.2	2.
1.7	102.	11.6	73.	10.5	79.	11.5	71.	9.4	76.	15.2	131.	1.7	93.	5.8	41.	3.3	7.	0.8	5.	3.6	34.
6.8	120.	0.	133.	3.8	143.	5.1	103.	4.7	93.	2.1	129.	5.4	146.	13.1	31.	4.7	40.	0.3	42.	0.6	65.
2.8	166.	9.7	155.	11.2	142.	8.6	148.	9.7	151.	11.9	124.	15.0	55.	14.5	17.	8.5	64.	1.1	27.	2.0	70.
0.	137.	2.5	121.	1.8	113.	4.5	122.	5.6	98.	10.0	65.	13.4	42.	13.0	55.	8.5	89.	3.3	38.	7.7	63.
24.6	15.	30.1	138.	33.5	179.	2.7	114.	0.1	87.	0.5	57.	11.3	133.	4.8	69.	22.5	83.	3.9	46.	7.7	79.
25.8	129.	29.8	122.	28.4	115.	28.2	117.	29.4	104.	13.7	43.	8.3	73.	10.3	85.	10.9	75.	7.7	57.	10.3	78.
1.2	87.	3.1	81.	3.8	80.	4.5	63.	6.6	57.	5.9	58.	5.1	62.	5.5	58.	4.7	54.	5.4	33.	4.7	58.
4.3	52.	3.7	59.	4.2	54.	7.4	54.	8.0	55.	8.3	64.	3.1	74.	8.8	57.	0.6	57.	4.4	32.	5.0	77.
7.1	1.	6.6	1.	5.5	16.	7.6	3.	7.4	15.	8.4	49.	3.5	58.	4.3	36.	0.4	78.	2.3	29.	2.6	135.
24.9	11.	23.1	7.	20.8	17.	12.5	3.	13.4	16.	10.1	5.	0.5	0.	3.3	3.	0.2	53.	1.5	27.	1.1	72.
5.9	116.	20.0	70.	2.3	108.	10.5	16.	7.7	8.	2.8	63.	3.1	24.	1.5	8.	1.4	2.	6.6	10.	4.4	19.
18.4	114.	15.3	132.	8.5	63.	11.4	121.	0.2	59.	3.6	78.	1.4	56.	6.1	21.	5.0	50.	0.8	16.	2.4	17.
17.5	56.	5.9	111.	12.7	53.	9.8	58.	12.2	68.	15.3	105.	3.1	73.	0.5	77.	10.4	61.	3.8	32.	1.6	14.
8.5	83.	0.1	42.	10.5	92.	9.1	102.	0.1	76.	2.9	127.	14.5	61.	6.6	122.	6.3	38.	8.3	32.	0.6	55.
7.7	40.	7.4	49.	2.3	64.	2.1	47.	4.0	6.	18.3	157.	9.0	19.	1.2	66.	3.4	14.	0.1	30.	5.4	53.
4.7	50.	1.3	92.	15.6	139.	18.0	151.	13.8	134.	14.2	164.	2.5	35.	14.8	165.	11.1	43.	3.5	54.	14.9	118.
0.9	15.	0.9	14.	0.2	22.	1.1	20.	1.0	14.	20.4	19.	7.1	27.	6.7	63.	6.5	46.	20.8	16.	0.7	68.
4.0	39.	27.7	14.	27.4	16.	27.1	26.	27.9	11.	25.6	8.	2.5	58.	2.4	56.	2.9	60.	0.7	35.	2.3	67.
0.6	55.	29.2	24.	30.0	27.	1.3	47.	4.9	65.	30.6	24.	4.0	60.	2.0	58.	3.6	44.	2.8	50.	2.5	59.
3.4	54.	4.8	54.	4.8	70.	3.8	72.	4.8	72.	4.8	59.	4.3	46.	3.7	30.	3.9	70.	3.7	40.	2.5	64.
3.6	54.	5.4	42.	5.2	52.	5.2	50.	6.7	54.	5.7	50.	3.5	51.	1.8	44.	5.5	69.	2.4	31.	1.6	64.
1.5	27.	3.0	20.	3.5	30.	3.7	30.	3.9	39.	5.0	26.	3.8	51.	3.5	47.	4.2	44.	2.6	38.	2.7	64.
1.6	38.	0.3	42.	1.5	41.	2.1	42.	3.3	50.	3.9	46.	4.0	57.	4.3	61.	1.8	27.	3.8	52.	4.4	74.
2.1	21.	1.6	36.	2.6	41.	2.9	31.	2.3	45.	5.3	57.	5.5	54.	3.8	79.	2.2	22.	6.7	54.	1.8	88.
2.1	16.	1.8	23.	0.4	27.	1.0	33.	0.7	50.	29.8	12.	2.8	58.	2.2	69.	1.1	81.	5.9	96.	1.9	125.
7.3	40.	8.7	49.	5.9	75.	5.6	75.	5.6	98.	0.4	67.	3.9	124.	3.7	131.	2.0	69.	2.2	123.	0.9	46.
2.1	44.	5.7	16.	3.4	45.	4.0	51.	4.1	46.	2.0	53.	1.4	48.	0.5	44.	10.0	18.	0.2	32.	4.0	54.
1.8	64.	2.3	62.	3.3	63.	4.3	57.	4.2	56.	4.0	56.	4.3	31.	4.1	36.	7.7	32.	3.4	28.	0.3	68.
2.7	65.	2.7	50.	2.9	57.	4.3	42.	4.1	50.	4.9	44.	5.4	30.	4.1	48.	1.0	48.	3.9	30.	7.4	97.

Fig. 10 COMPUTED DATA PRINTED FORMAT

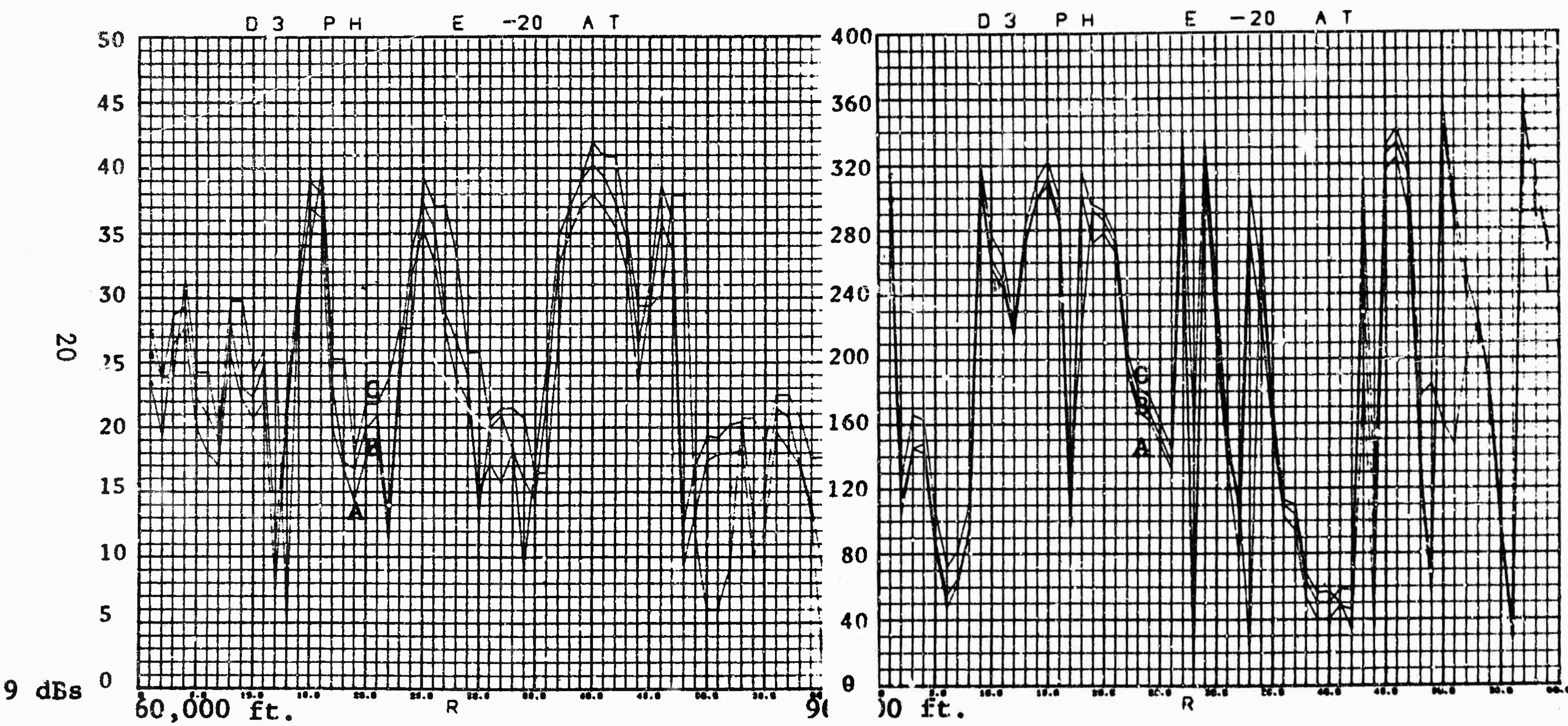


Fig. 11 PLOT FORMAT (TRAN T ANTENNA MEASURED DATA)

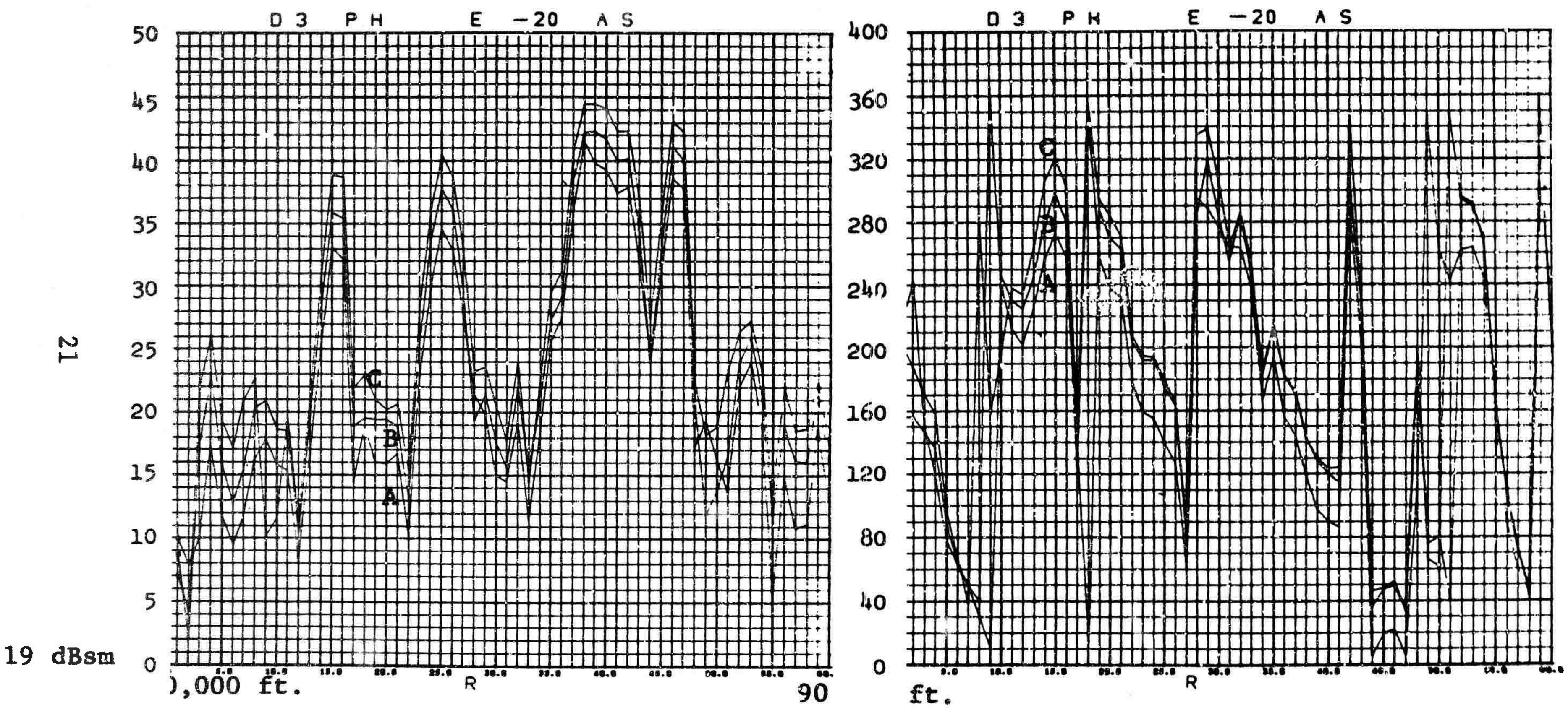


Fig. 12 PLOT FORMAT (SLAV TENNA MEASURED DATA)

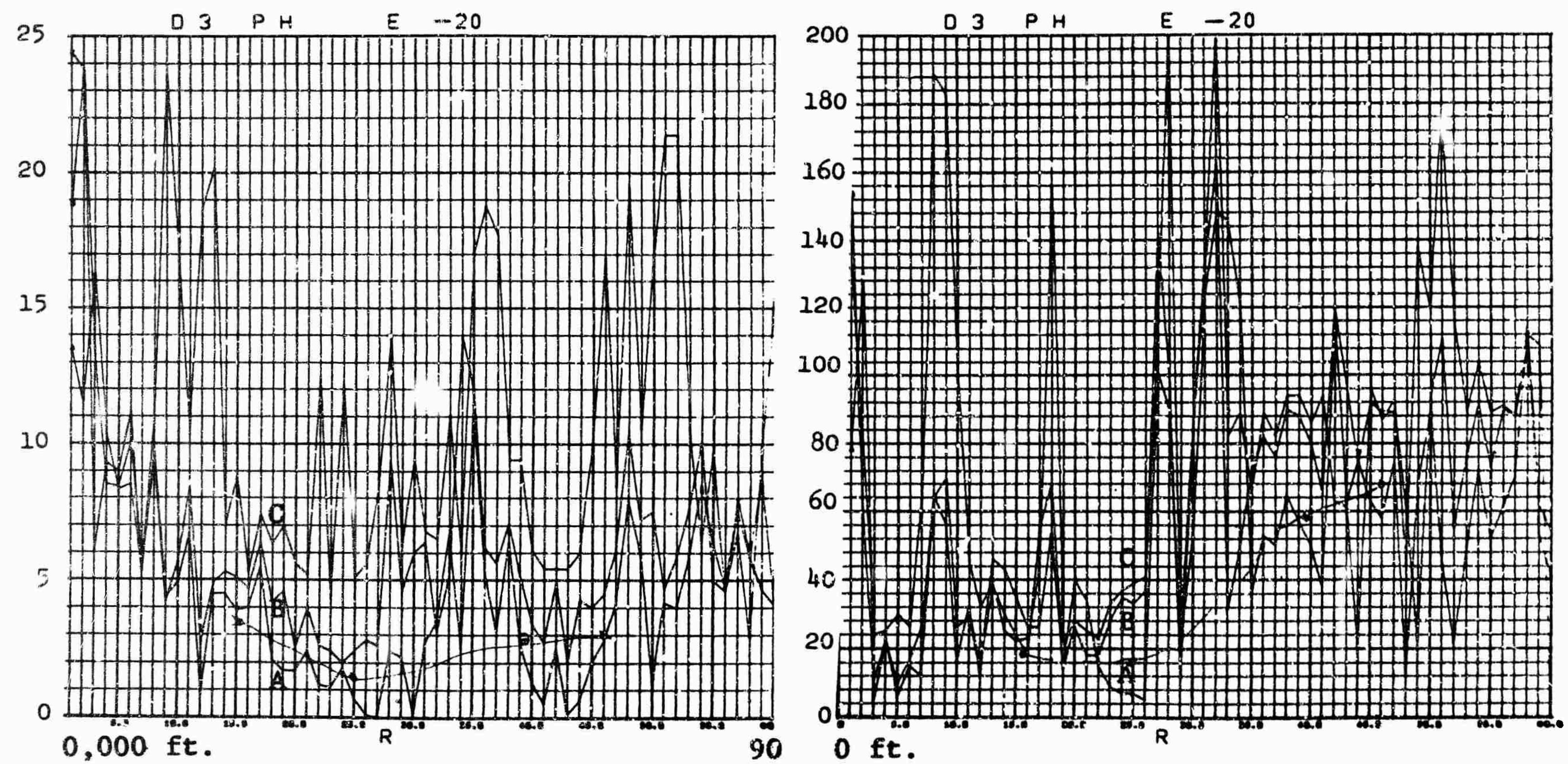


Fig.13 PLOT FORMAT (DIFFERENTIAL DATA)

In Figures 32 through 49 plotted data of the same type and order as the tabulated data is presented for the case of the first series of measurements. However, the plotted data is only three azimuth positions rather than the total eleven conditions used in the study. (Note that the data is shifted 2 dB and 10 degrees for each azimuth value greater than -20 degrees (curve A).)

By inspection of the tabulated differential amplitude and phase data (Figures 16, 31) as a function of azimuth and elevation it can be seen that the sensitivity of the data to azimuth misalignment between the slave antenna and transmit antenna is in general small (examine the data at ranges such that the amplitude values (sigma) are greater than 25 dB) except in regions where the misalignment is approaching one beamwidth. This fact can also be observed in the plotted data presented in Figure 34 through 49 although only three azimuth angles are represented.

The sensitivity of the data to range change can be found by observing the differential plots in regions where sigma is greater than 25 dB. It was found that the change in the sigma and phase differential data as a function of range was noticably greater than the changes observed in conjunction with angular alignment between the slave and transmit antenna. However, in both dimensions (angular and range), the correlation of the sigma and phase data obtained from the transmit and slave antenna is sufficient to allow a significant amount of RF cancellation to be obtained (vector subtraction).

The sensitivity of the sigma and phase differential data to polarization change (vertical-horizontal) can be seen to be "uncorrelatible" by inspection of both the tabulated and plotted data. That is, the sigma and/or phase differential at a selected range, elevation, and azimuth, changes significantly when the polarization is changed. Hence, it would be more difficult to implement a real time subtraction system to be used in conjunction with a radar in which the polarization was being changed during a measurement sequence.

In addition to the investigation of the differential data correlation as a function range and angle, measurements were repeated over a time span covering four days to obtain information as to the long term stability of the differential sigma and phase data. This information can be obtained by comparing the differential data identified by different days (e.g., D1 with D4 of Figures 34 and 16) at corresponding range, azimuth and elevation angles. In

general, it was found that the long term stability of the differential data was good from measurement sequence to measurement sequence. However, significant changes were noted between the first and last measurement sequence and in some cases during a measured sequence. This change was attributed to changes in the range scale. That is, the first range bin in one measurement sequence could be the second range bin in another due to drift in the transmitted time delay unit. Although the drift was checked for a time period equivalent to that required to measure the return from both the transmit antenna and slave antenna and found to be within the measurement accuracy of the electronic system (less than 0.5 dB and 3 degrees) decorrelation did occur between a number of measurement sequences. However, in most cases the range bin shifts were evident as illustrated by the black line in Figure 21.

DAY NUMBER- 4   POLARIZATION- HORIZ   ELEVATION- -20

TRANS ANTENNA 60 RANGE VALUES

-20.		-16.		-12.		-8.		-4.		0.		4.		8.		12.		16.		20.	
SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE
24.9	214.	25.4	216.	24.7	216.	23.4	190.	25.0	196.	25.2	196.	26.2	196.	24.7	196.	26.0	196.	24.1	196.	26.6	192.
23.0	42.	25.2	14.	22.6	40.	23.2	302.	25.3	317.	25.6	346.	25.2	10.	26.8	2.	23.2	30.	24.3	317.	25.9	312.
26.4	50.	26.9	33.	27.4	351.	26.6	56.	26.7	37.	26.4	32.	26.9	31.	26.6	33.	26.7	32.	26.0	40.	26.0	63.
28.5	39.	27.7	37.	28.6	32.	28.3	8.	27.9	14.	28.0	8.	22.2	15.	26.2	20.	24.0	17.	28.0	14.	28.2	16.
22.3	326.	21.4	332.	21.1	330.	19.5	314.	19.7	314.	19.9	314.	23.1	310.	21.1	318.	20.1	318.	21.1	316.	19.4	315.
19.2	299.	19.3	294.	18.0	297.	17.5	261.	17.9	204.	17.0	229.	17.4	278.	17.4	270.	17.9	279.	17.8	283.	18.3	280.
18.7	298.	18.2	293.	18.4	302.	18.4	292.	18.6	208.	17.6	282.	18.3	208.	18.0	282.	18.0	286.	16.9	292.	18.2	282.
26.3	334.	25.5	328.	25.7	327.	26.8	336.	26.0	332.	26.0	320.	25.6	324.	25.0	322.	25.3	324.	25.7	330.	25.9	327.
13.4	215.	12.9	204.	12.9	198.	9.5	182.	10.4	180.	8.4	176.	13.6	195.	9.3	177.	8.2	182.	6.0	186.	9.3	105.
20.0	169.	20.2	165.	29.0	166.	20.3	151.	20.0	150.	23.1	144.	18.4	191.	20.4	152.	18.9	150.	19.7	155.	20.2	150.
22.2	164.	21.9	160.	22.1	161.	18.9	134.	21.2	142.	21.6	140.	21.5	142.	21.7	164.	21.4	161.	21.3	142.	21.8	134.
15.0	137.	15.3	134.	14.3	145.	16.6	132.	17.4	93.	17.4	82.	16.3	98.	16.3	100.	17.0	94.	16.7	100.	16.1	74.
20.4	179.	20.5	178.	20.4	188.	19.8	166.	19.8	166.	20.2	164.	22.1	166.	19.8	164.	20.2	166.	19.9	164.	18.7	165.
29.6	200.	30.2	200.	30.0	201.	29.7	193.	29.8	181.	30.2	194.	33.3	183.	29.8	194.	30.0	185.	29.9	187.	28.3	202.
37.1	214.	37.2	214.	37.3	214.	36.7	189.	35.6	182.	37.3	196.	35.6	120.	35.5	185.	37.1	196.	36.7	194.	35.0	184.
36.2	194.	36.0	194.	35.9	190.	35.3	161.	34.3	156.	36.0	164.	35.6	166.	34.2	161.	34.7	162.	36.0	124.	34.4	136.
27.0	346.	26.2	14.	26.0	1.	24.6	270.	25.0	271.	25.0	272.	23.3	228.	23.0	269.	25.4	274.	25.6	289.	23.1	252.
15.8	140.	9.0	246.	8.3	249.	7.3	236.	6.4	235.	6.3	230.	8.0	242.	8.3	238.	7.6	236.	8.2	239.	3.4	220.
13.7	143.	14.6	218.	14.6	215.	13.2	230.	13.7	200.	13.9	200.	13.3	198.	16.6	199.	13.4	200.	16.1	201.	14.3	201.
17.3	194.	17.9	201.	18.7	194.	17.4	179.	17.1	178.	12.6	180.	17.4	179.	17.4	180.	16.5	184.	16.6	181.	17.5	202.
18.7	192.	19.0	193.	19.1	191.	19.5	176.	18.8	173.	18.3	173.	18.8	173.	18.4	173.	19.8	178.	17.7	174.	16.8	171.
13.1	126.	12.9	119.	12.4	113.	10.3	65.	16.1	69.	14.6	91.	16.7	72.	16.5	75.	15.3	78.	16.9	92.	15.9	78.
23.3	84.	23.7	85.	23.9	87.	24.0	71.	23.8	65.	23.9	69.	23.9	68.	24.1	69.	23.7	72.	23.4	74.	23.3	26.
31.1	75.	31.5	76.	31.6	78.	32.2	60.	31.6	59.	31.9	57.	31.8	57.	31.7	58.	31.3	64.	31.6	62.	21.5	62.
35.2	60.	33.2	61.	35.5	63.	35.3	45.	35.6	42.	35.6	41.	33.5	41.	35.2	42.	35.3	46.	35.1	46.	35.2	44.
33.4	42.	33.4	36.	33.4	37.	33.4	18.	33.1	20.	33.4	15.	33.1	339.	33.2	14.	33.8	23.	33.6	15.	33.2	20.
24.6	192.	24.5	203.	24.4	195.	22.4	154.	22.4	148.	23.1	152.	23.4	148.	22.9	162.	22.8	154.	22.7	154.	22.8	152.
26.2	291.	22.2	142.	27.4	309.	23.8	212.	21.7	132.	26.1	259.	26.5	256.	23.2	232.	26.2	272.	25.4	258.	25.4	293.
22.6	257.	23.7	266.	22.7	256.	22.3	236.	22.0	253.	23.1	243.	22.4	242.	22.6	240.	22.3	249.	22.3	261.	21.0	238.
12.5	230.	11.6	238.	10.3	225.	8.3	121.	16.6	246.	12.6	234.	12.4	231.	11.3	209.	9.2	210.	10.0	218.	10.2	238.
9.8	124.	8.7	132.	10.7	128.	10.8	99.	10.0	111.	6.7	108.	6.8	115.	9.9	102.	6.7	112.	0.2	138.	4.1	117.
15.5	118.	15.1	131.	16.2	125.	14.7	121.	16.2	125.	16.1	123.	13.9	121.	13.4	110.	16.0	129.	15.1	134.	14.9	135.
17.9	40.	14.5	64.	16.6	62.	22.2	300.	22.6	316.	19.9	349.	20.3	1.	23.1	282.	22.4	344.	14.6	76.	17.6	36.
14.0	237.	15.4	268.	14.8	265.	13.4	250.	13.6	255.	14.7	252.	14.5	256.	11.8	248.	13.1	249.	16.8	228.	15.4	260.
6.4	156.	6.9	150.	9.3	162.	6.3	118.	7.0	118.	6.5	125.	4.9	27.	7.4	83.	6.5	130.	5.3	146.	6.2	138.
24.7	6.	24.1	8.	24.2	2.	24.3	2.	24.8	349.	24.2	348.	25.3	340.	20.2	6.	24.2	350.	24.0	355.	22.3	344.
37.9	9.	33.0	10.	33.2	8.	31.5	339.	33.2	344.	33.2	336.	33.1	354.	33.1	341.	32.2	337.	32.7	357.	31.5	337.
35.7	335.	35.5	334.	35.6	354.	33.3	321.	35.1	318.	35.3	316.	35.3	316.	35.4	318.	35.1	320.	34.0	321.	35.2	312.
37.3	326.	37.4	324.	37.4	323.	37.1	311.	36.5	306.	37.5	308.	37.4	308.	36.7	307.	32.1	308.	36.6	311.	36.9	307.
38.3	334.	38.4	333.	33.4	332.	38.0	321.	38.4	322.	34.1	320.	38.3	319.	37.8	317.	37.3	320.	37.4	321.	37.2	318.
37.1	331.	36.9	352.	36.9	350.	36.4	345.	36.5	343.	36.7	343.	34.8	336.	36.6	344.	36.7	342.	35.9	339.	36.0	338.
35.4	0.	35.3	355.	35.3	339.	35.2	340.	35.0	2.	34.8	348.	34.6	352.	35.1	0.	34.5	1.	24.9	344.	34.2	338.
32.9	323.	30.8	200.	31.6	228.	30.9	87.	30.3	166.	30.5	143.	30.4	114.	30.1	139.	29.8	192.	29.8	138.	30.0	116.
23.6	106.	25.7	300.	25.2	322.	21.7	202.	24.9	294.	22.6	230.	22.4	212.	22.9	246.	25.8	11.	20.7	231.	20.8	216.
29.6	239.	29.9	239.	29.7	240.	30.4	239.	30.5	227.	33.3	227.	33.4	226.	30.2	227.	29.4	228.	29.3	232.	29.8	206.
36.5	251.	36.7	252.	36.6	252.	36.3	237.	34.5	235.	36.6	240.	36.5	238.	36.8	239.	36.3	239.	35.7	242.	36.1	240.
34.1	237.	33.6	232.	33.7	234.	33.5	159.	34.4	216.	33.4	221.	33.7	234.	33.0	217.	33.2	215.	33.8	210.	32.0	210.
14.6	204.	22.1	206.	12.6	180.	16.5	213.	13.5	164.	18.8	230.	15.3	196.	13.8	196.	14.9	193.	12.6	168.	24.0	205.
14.9	200.	13.4	194.	13.1	188.	12.7	158.	13.3	111.	13.9	190.	12.7	166.	11.9	156.	12.7	145.	12.9	121.	12.3	104.
6.0	150.	4.6	179.	3.9	169.	6.2	133.	15.2	48.	5.3	156.	5.1	149.	5.4	153.	5.2	129.	10.7	77.	5.1	166.
13.1	200.	13.1	196.	12.3	196.	13.4	186.	13.7	209.	14.0	186.	12.2	182.	12.6	180.	11.6	179.	14.0	229.	14.6	184.
15.0	170.	16.0	168.	14.3	164.	14.3	150.	15.6	152.	15.8	160.	15.4	152.	16.4	151.	14.7	140.	14.2	133.	15.5	152.
16.1	143.	16.2	136.	15.6	141.	15.7	106.	13.5	112.	14.7	124.	16.3	104.	14.2	106.	14.4	108.	14.9	115.	16.0	103.
13.7	63.	14.9	32.	13.8	56.	18.4	295.	20.5	313.	15.9	32.	18.4	284.	20.3	301.	19.8	296.	20.4	302.	16.3	271.
19.4	303.	19.9	299.	19.4	295.	19.3	278.	19.9	282.	23.2	282.	17.2	222.	20.3	229.	20.1	274.	17.6	279.	19.3	224.
20.4	284.	20.0	282.	19.4	284.	16.4	262.	20.1	272.	23.1	272.	23.1	222.	16.9	259.	18.1	266.	18.7	266.	20.4	220.
15.1	260.	15.8	264.	15.2	270.	13.6	250.	13.3	253.	14.8	257.	14.6	258.	13.4	248.	14.3	257.	14.7	256.	14.4	260.
9.2	247.	10.6	237.	11.5	274.	10.1	228.	8.9	233.	7.7	213.	8.9	236.	8.7	226.	2.1	234.	10.1	234.	6.6	234.
7.0	251.	7.3	224.	7.6	229.	6.4	224.	3.5	227.	1.6	214.	6.7	251.	6.4	235.	4.0	279.	7.0	236.	5.8	246.
15.4	331.	9.4	313.	6.1	169.	20.2	308.	17.4	304.	17.8	314.	18.3	336.	22.2	331.	17.7	304.	23.1	306.	19.5	309.

Fig. 14 TABULATED MEASURED DATA (TRANSMIT ANT, HOR POL, E-20)

SLAVE ANTENNA 60 RANGE VALUES

-20.		-16.		-12.		-8.		-4.		0.		4.		8.		12.		16.		20.	
SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE
11.5	212.	13.7	213.	15.1	190.	16.1	194.	18.3	198.	19.7	202.	23.7	211.	21.4	213.	22.5	221.	25.8	228.	23.6	238.
15.0	214.	15.2	213.	13.9	205.	15.2	201.	17.8	225.	17.7	213.	17.6	206.	18.6	208.	18.6	218.	20.2	232.	18.8	226.
0.1	126.	0.1	114.	4.9	42.	16.6	64.	21.0	33.	22.3	46.	23.4	53.	25.0	54.	24.6	58.	23.3	62.	26.6	72.
10.7	73.	18.6	56.	21.4	39.	23.5	20.	25.9	11.	26.2	22.	26.7	39.	27.3	36.	27.8	45.	28.1	46.	28.3	58.
17.0	357.	19.3	325.	18.7	316.	18.6	314.	18.7	310.	19.0	314.	23.5	332.	10.4	325.	20.7	328.	21.1	317.	20.9	352.
13.6	201.	14.4	273.	14.8	274.	15.5	278.	17.1	276.	15.1	283.	16.3	295.	36.5	296.	17.0	302.	16.3	302.	17.0	311.
11.7	240.	12.5	252.	13.3	259.	13.7	259.	13.7	263.	15.2	257.	16.3	282.	16.6	282.	16.9	292.	17.5	294.	16.6	332.
18.0	293.	19.3	298.	19.6	310.	21.6	312.	22.5	324.	23.2	331.	25.7	326.	26.6	345.	25.3	342.	26.1	350.	25.4	320.
14.0	243.	13.5	264.	12.3	264.	12.0	260.	15.5	253.	9.7	240.	14.0	267.	9.6	245.	10.8	254.	8.4	250.	9.6	290.
8.4	200.	9.9	186.	11.1	175.	11.5	162.	13.9	154.	15.3	133.	17.7	168.	18.1	167.	18.6	176.	19.0	170.	18.6	190.
9.7	154.	10.8	148.	14.2	147.	15.4	144.	16.9	135.	19.1	143.	18.7	133.	19.9	163.	20.5	167.	21.0	176.	23.7	179.
8.9	156.	7.9	143.	9.5	135.	10.5	133.	12.4	114.	12.7	134.	13.2	132.	15.5	112.	14.0	15[illegible].	14.1	142.	14.7	130.
15.3	170.	16.4	1[illegible].	18.2	177.	17.1	175.	18.2	172.	18.4	176.	18.0	183.	18.6	186.	19.5	190.	19.9	186.	18.7	199.
24.6	181.	26.1	189.	27.3	194.	28.1	193.	29.2	192.	29.1	186.	29.8	200.	29.7	208.	30.3	204.	30.4	210.	29.6	2[illegible]3.
32.7	193.	33.8	20[illegible].	34.8	206.	35.5	204.	35.6	199.	39.4	197.	37.6	212.	37.2	206.	38.4	216.	38.3	220.	37.5	229.
32.5	190.	33.7	193.	34.5	193.	35.5	189.	35.0	174.	36.9	180.	35.7	188.	36.2	186.	37.3	182.	37.8	201.	37.6	233.
23.7	40.	24.4	58.	24.3	54.	25.7	12.	26.9	297.	27.3	294.	26.2	310.	28.6	312.	27.9	300.	28.2	324.	28.0	342.
9.6	245.	10.7	260.	15.3	259.	8.1	247.	7.1	235.	6.5	252.	13.4	243.	7.1	236.	6.8	254.	7.8	254.	7.7	263.
9.8	209.	11.8	216.	11.5	215.	1[illegible].9	215.	11.7	204.	13.2	210.	11.5	215.	12.8	214.	13.5	216.	14.0	222.	15.1	225.
12.3	180.	13.9	186.	14.4	193.	15.1	188.	15.8	184.	16.0	192.	16.7	198.	17.4	206.	17.7	205.	17.7	200.	19.1	212.
15.5	174.	15.7	175.	15.4	183.	17.3	176.	16.1	173.	17.9	182.	18.4	187.	18.2	196.	19.2	195.	19.1	188.	18.0	230.
12.1	126.	13.2	122.	13.3	126.	14.7	115.	16.9	103.	13.3	130.	13.4	105.	15.8	112.	13.1	109.	14.4	116.	14.3	118.
21.0	48.	22.3	93.	23.1	97.	24.4	90.	24.9	89.	25.9	91.	26.2	94.	23.3	96.	23.3	100.	25.7	97.	26.2	390.
30.7	77.	31.0	85.	32.4	91.	32.9	83.	33.3	81.	33.4	84.	33.9	87.	34.1	89.	35.7	92.	33.6	90.	32.5	82.
34.3	62.	35.6	70.	36.5	76.	37.2	67.	37.6	65.	37.9	75.	39.1	74.	38.1	76.	37.9	76.	37.8	74.	36.7	76.
33.3	42.	34.3	53.	34.7	56.	35.3	46.	35.9	40.	36.1	46.	36.1	49.	36.3	52.	36.2	54.	35.4	63.	36.9	67.
26.0	230.	27.2	268.	27.7	267.	25.5	197.	25.9	165.	25.8	173.	25.9	183.	26.3	184.	29.8	107.	21.7	153.	26.6	170.
24.1	274.	22.5	275.	15.3	135.	22.1	266.	23.3	262.	24.0	260.	23.6	275.	23.0	250.	25.5	279.	24.7	270.	24.4	277.
20.4	234.	20.5	242.	22.1	262.	20.9	250.	19.9	249.	21.3	260.	22.3	262.	22.3	265.	22.7	264.	23.9	266.	22.8	267.
10.2	240.	8.9	234.	11.7	256.	13.7	256.	16.3	273.	13.6	274.	13.7	260.	16.4	274.	16.6	276.	14.9	296.	15.1	270.
9.3	239.	9.1	233.	9.7	212.	8.3	231.	6.5	174.	7.1	168.	5.7	164.	7.3	153.	4.5	145.	6.2	161.	3.2	176.
19.6	217.	19.5	212.	20.0	199.	20.0	194.	18.6	184.	19.1	180.	14.2	176.	10.7	176.	18.3	172.	16.6	166.	16.7	172.
14.7	196.	14.9	170.	15.5	150.	17.8	83.	21.4	59.	23.9	336.	22.8	358.	10.6	2.	23.7	320.	20.3	10.	18.3	70.
14.8	119.	14.2	112.	15.6	90.	19.2	54.	15.6	73.	4.7	130.	16.6	508.	8.7	250.	[illegible]	271.	16.8	312.	18.1	323.
24.4	141.	24.6	135.	24.6	121.	24.1	119.	25.8	108.	21.7	133.	22.4	107.	23.4	138.	10.7	106.	15.3	92.	15.5	118.
27.2	86.	27.8	86.	28.7	75.	28.5	76.	28.3	62.	28.3	54.	26.3	44.	27.4	60.	26.3	47.	26.0	39.	23.8	42.
34.2	73.	37.3	72.	37.1	39.	37.2	62.	37.2	56.	37.1	56.	35.3	48.	36.2	56.	33.4	47.	34.3	45.	33.9	44.
40.0	45.	43.4	44.	43.7	31.	43.8	34.	43.2	20.	43.3	29.	43.2	27.	38.5	28.	38.7	21.	37.7	10.	36.8	14.
39.8	31.	40.4	32.	43.8	18.	43.9	22.	41.0	16.	40.9	18.	43.6	16.	40.8	16.	39.1	7.	38.3	6.	36.4	1.
39.1	32.	39.6	33.	40.0	20.	40.4	28.	40.5	26.	40.5	26.	43.1	22.	39.7	20.	58.1	7.	58.2	4.	36.7	2.
37.7	274.	38.4	26.	30.6	26.	38.2	38.	38.5	43.	37.7	218.	57.6	31.	37.3	64.	34.5	35.	33.5	16.	32.6	6.
36.9	146.	37.3	191.	37.5	192.	37.2	153.	37.1	179.	37.0	128.	36.2	19.	36.3	2.	32.8	138.	32.6	128.	30.3	113.
22.0	105.	31.0	128.	35.0	110.	33.3	94.	53.3	120.	53.7	46.	32.8	152.	32.2	137.	30.1	88.	31.1	96.	37.0	84.
26.4	297.	26.0	294.	25.9	282.	25.4	278.	25.2	274.	24.9	273.	25.4	275.	24.1	278.	23.0	249.	21.3	252.	23.6	233.
32.6	304.	32.8	300.	33.0	292.	33.3	300.	33.2	297.	33.0	293.	32.6	292.	31.8	288.	30.9	282.	29.6	278.	28.4	275.
39.0	316.	39.3	315.	39.7	306.	39.0	313.	39.9	307.	39.6	336.	37.3	534.	36.8	299.	38.1	294.	36.9	286.	35.3	286.
37.8	303.	38.1	303.	38.1	292.	37.3	278.	37.9	290.	39.6	299.	36.6	265.	36.6	270.	35.7	274.	36.9	271.	33.1	265.
19.9	274.	15.0	215.	20.4	271.	14.5	203.	20.1	273.	21.0	273.	23.2	268.	19.0	266.	17.9	237.	16.1	232.	10.9	[illegible]
16.6	278.	13.8	264.	17.4	264.	7.5	195.	16.7	267.	16.9	298.	13.4	234.	17.0	294.	16.3	256.	14.0	244.	18.3	288.
6.5	278.	4.6	224.	5.7	228.	0.1	168.	5.4	210.	6.6	222.	6.6	222.	3.3	228.	8.5	240.	6.7	239.	9.5	263.
15.3	235.	14.8	206.	14.7	300.	14.7	208.	14.5	204.	15.5	215.	15.2	217.	13.9	243.	16.0	222.	13.7	232.	14.1	236.
22.7	214.	22.4	213.	22.3	207.	21.9	209.	21.5	207.	21.3	210.	23.8	211.	20.1	211.	19.0	208.	17.7	202.	17.3	239.
24.8	214.	24.7	218.	23.5	210.	23.2	210.	23.4	208.	22.3	208.	25.6	202.	20.3	203.	17.3	196.	17.5	188.	17.6	182.
19.7	198.	19.5	197.	19.9	180.	17.8	171.	16.4	176.	15.3	169.	12.3	142.	11.0	136.	10.0	148.	11.3	108.	11.0	111.
0.7	93.	0.7	92.	2.3	79.	13.1	64.	7.0	69.	8.6	62.	15.4	53.	11.6	56.	9.4	60.	19.0	8.	19.2	8.
12.1	58.	14.7	50.	17.0	32.	23.1	350.	21.0	342.	20.5	354.	18.7	328.	20.5	348.	20.3	333.	17.9	318.	18.6	319.
17.8	354.	19.3	331.	14.5	312.	17.3	290.	17.1	294.	16.6	332.	13.9	295.	14.7	294.	14.1	295.	13.6	288.	14.8	293.
15.9	276.	15.1	278.	14.6	270.	12.9	272.	13.3	268.	11.8	271.	11.8	271.	11.7	270.	12.3	274.	9.7	267.	11.4	275.
9.9	253.	9.6	239.	8.1	232.	6.8	220.	6.3	226.	7.1	240.	6.6	242.	6.3	244.	8.1	257.	7.1	254.	8.4	267.
7.9	168.	6.7	178.	5.7	178.	6.4	142.	5.2	187.	4.2	234.	3.9	234.	8.6	279.	13.9	291.	26.0	327.	13.5	317.

Fig. 15 TABULATED MEASURED DATA (SLAVE ANT, HOR POL, E-20)

DAY NUMBER- 4 POLARIZATION- HORIZ ELEVATION- -20

-20.		-16.		-12.		-8.		-4.		0.		4.		8.		12.		16.		20.	
DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI
13.4	2.	11.5	6.	7.4	26.	7.5	4.	6.7	0.	5.5	6.	4.3	17.	3.3	19.	2.1	27.	0.3	32.	1.	44.
3.0	172.	13.9	163.	4.7	166.	9.3	101.	7.5	94.	6.2	133.	7.6	166.	7.6	194.	4.9	188.	4.1	83.	7.1	80.
26.3	76.	26.8	81.	22.5	101.	13.3	28.	5.7	7.	3.9	14.	3.5	19.	1.6	21.	2.1	26.	0.7	22.	1.6	23.
17.8	34.	9.1	19.	7.1	6.	4.2	12.	2.0	3.	1.3	14.	1.2	24.	9.9	16.	8.2	28.	0.8	32.	8.3	42.
3.3	26.	2.1	5.	2.4	14.	0.9	3.	1.0	4.	0.9	3.	3.4	16.	3.7	7.	0.6	10.	0.	1.	1.5	17.
4.6	34.	3.4	21.	3.2	23.	2.0	3.	0.8	3.	0.9	8.	0.9	17.	0.3	18.	0.9	23.	1.3	14.	1.2	21.
7.0	52.	5.7	41.	5.1	43.	4.3	33.	4.9	25.	2.4	13.	2.3	3.	1.4	0.	1.8	0.	0.8	[illegible]	1.7	23.
8.3	91.	6.5	30.	6.1	12.	5.2	24.	3.5	8.	2.0	7.	1.9	2.	8.4	25.	0.2	8.	0.4	28.	0.5	4.
0.4	48.	0.6	63.	0.4	66.	2.5	78.	0.1	73.	1.3	22.	3.4	72.	6.3	66.	2.6	22.	1.6	32.	8.4	65.
11.6	32.	13.5	21.	4.9	9.	3.3	11.	6.1	4.	4.6	9.	1.3	12.	2.3	19.	0.5	24.	0.7	24.	1.6	36.
13.0	0.	11.1	12.	7.9	14.	4.3	10.	4.4	7.	3.5	5.	0.2	10.	1.6	16.	0.9	26.	8.3	32.	1.2	43.
9.1	19.	7.4	7.	5.0	10.	6.1	31.	5.0	21.	4.7	32.	3.1	34.	0.4	12.	3.0	49.	2.6	42.	1.4	76.
5.1	8.	4.1	4.	2.2	3.	2.7	9.	1.6	6.	1.4	12.	1.3	17.	1.2	22.	0.7	24.	0.	30.	1.0	24.
5.0	19.	5.1	11.	2.7	6.	1.4	3.	1.6	11.	1.1	10.	0.9	17.	0.1	14.	0.3	19.	1.1	23.	0.1	51.
4.4	21.	3.4	11.	2.5	8.	1.1	15.	0.	11.	1.7	1.	2.3	34.	1.7	21.	1.3	30.	1.6	24.	1.7	30.
3.7	16.	2.3	4.	1.4	3.	0.5	28.	0.7	20.	3.9	24.	1.1	22.	1.0	23.	2.0	20.	1.3	37.	2.0	64.
3.3	54.	1.3	44.	1.7	55.	2.1	102.	1.9	21.	2.5	22.	1.2	32.	5.0	43.	0.2	26.	2.6	39.	4.9	90.
1.2	106.	1.7	14.	2.0	18.	0.8	11.	1.3	20.	0.	22.	2.4	23.	1.2	16.	0.7	18.	0.4	15.	4.3	30.
0.9	61.	2.6	2.	3.1	0.	2.3	15.	2.0	4.	0.7	13.	1.8	17.	1.3	15.	0.1	16.	0.1	21.	0.9	26.
5.0	14.	4.0	15.	4.3	6.	2.3	9.	1.3	3.	1.6	12.	3.7	19.	0.	24.	1.2	21.	1.1	27.	1.6	30.
3.7	10.	3.3	18.	2.3	8.	2.2	2.	2.7	0.	0.4	9.	3.4	12.	3.2	21.	0.2	17.	1.4	24.	1.2	79.
1.0	0.	0.3	5.	0.4	13.	1.3	47.	0.1	31.	0.9	9.	3.3	33.	0.7	37.	0.2	31.	0.3	24.	1.6	40.
2.3	4.	1.6	8.	0.3	17.	0.4	19.	1.5	23.	2.1	13.	2.3	26.	1.4	27.	1.8	20.	2.3	25.	0.9	28.
0.9	2.	0.5	9.	0.8	13.	0.7	23.	1.7	22.	1.5	27.	2.1	33.	2.4	31.	2.4	28.	2.0	20.	1.8	40.
0.9	2.	0.4	9.	3.0	14.	1.4	24.	2.2	28.	2.3	29.	2.6	33.	2.9	32.	2.6	30.	2.7	28.	1.5	32.
0.1	0.	0.4	17.	1.3	19.	1.4	28.	2.8	20.	2.7	25.	3.2	53.	3.1	30.	3.2	31.	3.0	20.	1.7	27.
1.4	48.	2.4	65.	9.3	72.	3.1	43.	5.1	15.	2.7	3.	2.5	32.	3.4	24.	3.0	31.	1.0	4.	1.7	13.
2.1	35.	0.3	138.	11.1	173.	1.7	52.	1.6	130.	2.1	9.	2.9	19.	2.2	18.	0.6	7.	0.7	12.	1.3	27.
2.2	23.	3.2	24.	0.6	6.	2.0	14.	7.1	1.	1.6	17.	3.1	20.	3.1	25.	0.4	19.	0.6	25.	0.4	29.
2.3	10.	2.7	3.	1.4	31.	4.7	135.	0.3	24.	3.0	40.	3.3	29.	3.1	65.	7.6	64.	4.0	36.	4.8	62.
0.5	106.	0.4	98.	3.0	84.	2.5	103.	3.5	65.	1.6	60.	0.2	49.	2.6	55.	3.3	33.	0.9	25.	3.0	57.
4.1	99.	4.4	31.	3.3	74.	5.3	73.	0.4	59.	3.2	57.	5.3	46.	3.3	54.	4.0	43.	1.5	32.	8.2	57.
3.2	154.	0.4	114.	1.1	38.	4.4	140.	0.8	91.	4.1	19.	2.4	3.	3.3	25.	1.2	13.	5.7	64.	1.1	34.
0.8	138.	1.2	256.	0.6	175.	5.8	164.	2.2	175.	13.0	132.	2.3	42.	3.1	18.	2.6	22.	0.	34.	2.7	65.
18.0	15.	17.7	12.	16.1	41.	15.1	1.	10.8	10.	17.2	25.	17.5	30.	13.2	25.	13.2	24.	10.0	34.	9.3	20.
3.0	80.	3.3	78.	4.5	62.	4.5	72.	3.4	73.	4.1	70.	1.3	58.	1.3	54.	2.2	62.	0.	64.	0.9	50.
3.3	63.	4.0	62.	3.9	51.	5.7	83.	4.0	73.	3.9	63.	3.2	48.	3.1	75.	3.2	90.	1.0	40.	1.9	67.
4.3	67.	4.9	73.	5.1	57.	5.5	73.	8.1	62.	5.2	70.	4.9	71.	4.1	70.	3.6	65.	3.9	57.	1.8	59.
2.5	65.	3.0	68.	3.4	55.	3.8	71.	4.5	70.	3.4	70.	3.0	46.	3.3	67.	2.8	59.	1.7	53.	0.5	54.
0.8	58.	1.2	60.	1.6	48.	2.4	67.	2.1	42.	2.2	64.	1.8	63.	1.9	43.	0.8	67.	0.8	45.	1.3	44.
0.4	77.	1.5	34.	1.7	34.	1.6	93.	2.0	57.	1.0	120.	2.3	55.	0.7	58.	0.2	51.	0.3	37.	3.6	28.
1.3	146.	2.0	165.	2.7	166.	2.0	170.	2.1	179.	2.2	143.	3.4	90.	8.4	2.	1.7	137.	1.4	144.	4.4	132.
0.1	142.	2.2	72.	2.0	118.	2.9	7.	3.2	44.	3.2	47.	2.4	38.	2.1	2.	0.9	104.	2.1	42.	8.	30.
2.8	179.	0.3	6.	0.3	40.	3.7	76.	0.3	18.	2.3	40.	1.6	63.	1.2	24.	2.8	126.	0.6	31.	3.6	37.
3.0	65.	2.9	67.	3.3	52.	2.6	70.	2.9	70.	2.7	68.	2.3	40.	1.4	61.	1.5	54.	0.3	46.	1.5	49.
2.5	65.	2.9	63.	3.1	52.	3.5	73.	3.4	69.	3.0	64.	2.8	64.	2.0	60.	1.3	35.	1.8	44.	8.3	44.
3.7	66.	6.5	71.	6.4	58.	3.5	119.	1.3	74.	6.2	42.	3.9	36.	3.6	53.	2.5	59.	1.7	61.	8.3	48.
5.3	70.	7.1	71.	7.7	91.	2.3	13.	6.6	106.	2.2	37.	4.7	72.	3.2	68.	3.0	64.	3.5	84.	13.1	121.
1.7	78.	0.2	70.	4.3	81.	5.4	37.	1.2	156.	3.0	68.	2.2	83.	5.1	98.	3.0	109.	1.2	123.	6.0	134.
0.3	48.	0.	49.	3.2	39.	6.1	18.	9.8	173.	1.3	66.	1.5	73.	0.1	26.	3.1	111.	4.0	182.	4.4	94.
2.2	5.	1.7	12.	2.4	10.	1.3	22.	0.6	5.	1.5	29.	3.0	35.	3.3	42.	2.4	43.	8.3	9.	0.3	52.
6.7	46.	6.4	45.	6.2	43.	7.2	59.	5.9	55.	5.7	50.	5.4	59.	3.7	68.	4.3	60.	3.3	49.	1.8	37.
4.7	71.	8.6	80.	7.9	69.	7.5	109.	7.9	95.	7.6	84.	4.0	90.	6.1	99.	2.9	68.	2.6	73.	1.4	89.
6.0	135.	4.6	145.	4.7	137.	0.6	124.	4.1	137.	0.4	137.	6.1	146.	9.2	149.	9.3	148.	9.1	166.	9.3	160.
19.2	150.	19.2	153.	17.1	143.	8.9	146.	12.2	143.	11.4	140.	1.3	138.	8.7	143.	16.7	146.	1.4	89.	8.2	84.
8.3	136.	5.3	126.	1.8	100.	3.7	80.	0.4	73.	3.4	42.	3.6	56.	3.6	82.	1.2	71.	0.8	92.	1.3	49.
4.7	88.	3.5	67.	3.3	42.	3.7	60.	5.3	41.	1.8	45.	1.3	37.	3.0	44.	1.8	29.	0.9	32.	0.1	33.
6.3	29.	4.5	41.	3.1	4.	2.8	44.	4.4	90.	4.1	50.	2.0	35.	5.0	44.	5.2	40.	0.4	33.	3.0	39.
2.9	18.	2.3	14.	0.5	3.	0.4	4.	2.8	1.	5.5	36.	0.1	9.	3.2	21.	4.1	22.	0.1	13.	4.6	21.
7.5	177.	2.9	135.	0.4	9.	13.9	246.	12.2	117.	13.6	69.	12.1	70.	16.7	32.	5.8	33.	0.7	21.	4.1	9.

Fig. 16 TABULATED DIFFERENTIAL DATA (HOR POL, E-20)

DAY NUMBER- 4 POLARIZATION- HORIZ ELEVATION-

TRANS ANTENNA 60 RANGE VALUES

-20.		-16.		-12.		-8.		-4.		0.		4.		8.		12.		16.		20.	
SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE
24.5	214.	25.0	202.	25.1	198.	24.3	190.	23.2	23.	25.3	182.	24.2	176.	24.6	176.	24.5	176.	26.0	190.	24.8	176.
17.9	95.	18.6	99.	18.1	110.	18.1	126.	26.3	281.	19.5	96.	20.8	85.	21.8	62.	23.9	35.	19.4	19.	21.4	74.
27.1	36.	26.9	36.	26.6	30.	26.1	38.	26.9	18.	26.9	14.	25.7	15.	27.1	8.	26.9	11.	27.6	5.	27.3	10.
28.1	40.	28.4	25.	29.0	16.	27.8	22.	28.0	0.	27.2	4.	27.5	1.	27.7	358.	27.8	354.	27.9	5.	28.9	2.
21.3	332.	20.9	320.	29.3	314.	21.1	318.	20.1	304.	16.8	302.	16.2	302.	16.4	298.	16.6	300.	19.4	306.	20.1	304.
18.8	289.	18.2	289.	17.3	280.	18.9	288.	18.7	270.	18.4	265.	17.8	263.	17.5	260.	18.8	262.	18.3	264.	17.5	261.
18.6	296.	17.6	288.	19.6	292.	18.7	285.	17.6	272.	18.7	267.	18.8	267.	16.8	262.	18.5	268.	18.5	267.	19.8	266.
25.4	303.	26.2	329.	25.9	323.	24.4	320.	26.1	314.	26.4	312.	24.3	317.	25.9	306.	26.1	313.	23.6	314.	25.7	312.
13.5	211.	11.8	214.	10.2	203.	10.8	212.	6.5	220.	6.3	203.	7.3	210.	9.3	205.	8.2	201.	10.1	202.	8.3	168.
20.5	164.	20.2	158.	20.2	155.	19.7	156.	20.0	148.	18.6	136.	18.3	136.	13.8	136.	18.4	136.	20.4	136.	16.4	138.
21.9	156.	21.9	151.	21.7	144.	21.5	148.	20.6	132.	21.2	128.	23.2	124.	20.6	124.	20.7	127.	21.2	138.	21.6	126.
14.7	134.	16.1	126.	15.3	119.	15.6	127.	16.0	76.	17.0	62.	15.2	63.	16.7	84.	16.3	87.	16.1	100.	16.3	98.
21.1	176.	20.2	168.	20.0	163.	20.1	172.	18.7	142.	19.2	144.	19.5	144.	16.8	140.	18.9	148.	19.9	148.	16.7	144.
30.6	195.	33.4	188.	30.0	187.	29.0	189.	30.5	167.	29.3	168.	28.7	164.	29.9	164.	29.9	167.	29.6	165.	30.3	153.
37.3	208.	37.5	200.	37.3	194.	37.1	202.	36.7	180.	36.7	177.	36.4	175.	37.2	176.	37.2	175.	37.3	177.	37.2	176.
36.2	198.	36.1	183.	35.9	178.	35.5	184.	36.0	166.	35.5	158.	35.5	160.	35.6	139.	36.1	138.	35.9	162.	36.1	148.
24.5	31.	24.9	30.	24.4	26.	24.3	34.	25.4	16.	26.4	342.	26.3	6.	25.2	353.	26.6	333.	26.2	352.	26.5	348.
9.5	240.	15.2	242.	9.5	238.	10.5	246.	9.9	240.	10.0	262.	9.1	228.	6.9	333.	5.7	198.	9.9	221.	8.8	228.
14.0	212.	15.0	209.	15.5	204.	14.7	213.	15.6	190.	14.8	196.	13.7	194.	14.0	182.	15.9	188.	15.2	189.	15.2	162.
18.0	198.	17.7	188.	17.0	183.	18.2	189.	17.7	169.	17.3	169.	17.1	168.	17.1	164.	16.9	166.	18.0	167.	16.4	167.
19.8	159.	19.7	182.	19.2	176.	18.4	178.	18.3	159.	17.8	156.	17.4	163.	17.5	155.	18.3	155.	18.3	158.	16.8	160.
13.0	127.	14.4	114.	14.1	69.	12.6	120.	13.6	86.	15.6	89.	16.3	86.	14.7	94.	14.4	75.	15.0	93.	14.2	82.
24.2	95.	24.0	76.	24.1	70.	24.7	70.	23.0	57.	23.1	92.	22.6	48.	24.1	44.	23.7	44.	23.3	48.	24.4	46.
31.9	74.	31.4	64.	31.7	58.	30.7	67.	31.8	42.	32.0	38.	31.5	40.	30.8	34.	32.6	37.	31.5	38.	31.7	39.
35.7	58.	34.9	52.	35.9	45.	35.5	48.	34.9	40.	35.4	28.	16.8	25.	35.4	25.	35.6	21.	35.7	26.	33.7	26.
33.4	60.	33.5	33.	33.2	27.	32.8	27.	32.6	23.	33.0	11.	32.7	7.	32.4	9.	33.0	6.	32.8	12.	33.4	11.
25.2	224.	25.5	235.	23.6	198.	23.7	206.	25.1	230.	22.6	190.	22.3	154.	22.7	200.	22.6	182.	23.0	202.	23.5	188.
22.1	326.	22.4	184.	21.8	149.	27.3	343.	23.6	76.	27.3	318.	26.9	263.	24.0	193.	23.3	166.	32.9	191.	23.9	160.
23.5	256.	22.5	265.	25.8	314.	22.2	228.	23.4	243.	23.1	226.	22.5	223.	22.1	220.	22.4	218.	22.0	222.	22.7	220.
11.2	233.	9.6	226.	16.4	263.	12.8	212.	12.0	222.	13.6	214.	13.6	217.	14.0	212.	14.2	218.	14.6	222.	18.0	213.
8.4	141.	6.1	148.	4.8	156.	6.5	133.	2.5	150.	3.2	150.	2.1	134.	0.2	154.	0.2	138.	0.1	150.	1.4	122.
16.7	125.	16.0	137.	15.8	139.	15.5	129.	15.8	127.	14.4	118.	13.9	120.	15.9	122.	13.7	117.	14.3	128.	14.1	116.
15.7	72.	12.9	105.	13.4	104.	14.4	106.	14.9	86.	14.8	65.	15.9	92.	15.5	84.	16.6	63.	16.1	62.	16.5	64.
15.4	262.	19.2	306.	18.5	320.	18.6	348.	17.0	284.	17.8	297.	18.8	317.	18.1	282.	16.0	240.	17.9	282.	15.8	262.
7.8	152.	8.4	156.	6.0	170.	8.5	186.	8.0	230.	9.5	226.	7.3	236.	6.2	198.	6.5	314.	7.5	210.	5.3	188.
24.2	3.	22.9	17.	23.9	4.	24.2	358.	24.2	334.	24.6	320.	23.7	316.	26.7	325.	24.2	322.	24.6	328.	24.5	329.
33.1	8.	32.3	14.	33.0	6.	33.1	358.	33.1	342.	33.4	338.	33.4	334.	33.1	333.	33.6	331.	33.4	336.	33.5	336.
35.6	330.	35.3	342.	35.3	332.	35.0	327.	35.5	308.	35.6	304.	34.8	267.	36.0	300.	35.7	287.	35.5	306.	35.6	302.
37.9	372.	35.9	329.	37.1	318.	37.3	314.	37.3	296.	37.5	293.	37.6	292.	37.4	281.	37.7	288.	37.4	294.	37.5	293.
38.0	329.	38.1	338.	37.4	326.	37.7	322.	38.1	305.	38.4	300.	37.1	301.	36.2	298.	36.9	300.	38.2	309.	38.1	303.
36.8	346.	36.2	353.	36.4	344.	36.4	342.	36.7	327.	36.7	320.	36.1	323.	36.7	322.	36.8	323.	36.7	326.	36.8	324.
35.6	352.	35.0	0.	35.0	352.	34.4	356.	34.9	348.	34.9	315.	34.9	341.	35.2	339.	35.2	346.	35.4	346.	35.3	346.
31.1	218.	32.3	272.	31.8	270.	32.3	316.	32.5	348.	30.6	236.	31.6	345.	32.1	360.	32.1	345.	32.2	354.	32.9	360.
26.3	331.	24.8	35.	24.9	33.	21.1	138.	22.5	208.	24.7	282.	21.0	198.	22.0	210.	20.6	186.	21.3	202.	21.1	208.
30.1	237.	30.1	244.	29.8	234.	29.9	227.	30.0	226.	37.1	229.	28.7	202.	33.1	208.	30.2	206.	30.4	206.	30.6	200.
36.8	251.	36.2	257.	36.4	246.	36.1	242.	37.0	235.	34.8	224.	34.2	222.	36.0	220.	34.9	220.	36.0	221.	36.8	223.
33.4	233.	33.4	240.	33.4	232.	32.6	230.	33.6	218.	33.7	208.	32.8	208.	33.5	206.	33.9	207.	33.8	208.	33.9	210.
15.3	399.	13.8	206.	12.7	175.	15.5	179.	13.7	148.	15.3	173.	13.2	176.	14.3	174.	16.2	175.	14.1	148.	15.0	168.
14.0	194.	13.7	203.	13.2	189.	13.6	165.	14.0	165.	13.5	136.	13.1	157.	13.1	165.	14.2	150.	13.2	196.	13.3	165.
5.6	174.	6.6	190.	5.9	172.	5.8	165.	6.1	129.	6.7	96.	6.1	118.	4.3	134.	5.8	111.	5.5	128.	3.8	132.
14.3	195.	14.0	207.	13.2	194.	12.4	186.	12.4	156.	16.4	88.	13.0	156.	10.8	166.	11.0	150.	11.9	162.	11.3	164.
14.7	166.	17.1	178.	15.8	163.	16.7	162.	15.4	150.	20.8	36.	15.2	141.	14.9	146.	15.7	142.	16.5	146.	16.3	144.
16.3	138.	15.5	147.	15.8	150.	15.7	135.	15.7	126.	13.7	176.	16.2	116.	13.9	128.	14.5	112.	13.8	123.	15.7	116.
14.2	54.	8.5	80.	10.8	64.	12.0	52.	12.6	53.	4.6	120.	17.3	23.	12.6	40.	18.5	358.	11.8	48.	15.9	23.
19.9	296.	19.9	313.	20.6	294.	19.9	289.	19.8	296.	22.8	204.	16.6	273.	20.7	267.	19.2	264.	20.5	272.	19.3	268.
19.9	250.	19.1	267.	20.5	276.	20.5	274.	19.9	276.	20.7	256.	20.0	262.	19.8	260.	21.5	258.	20.4	259.	21.2	260.
16.1	266.	13.8	272.	15.0	263.	15.5	259.	15.6	260.	13.8	265.	15.3	247.	15.0	254.	16.2	252.	15.3	254.	16.1	251.
11.7	256.	9.3	265.	11.0	244.	9.9	234.	11.0	239.	9.7	231.	10.0	233.	10.6	242.	10.2	234.	10.6	237.	10.8	235.
6.8	222.	6.5	244.	6.7	242.	5.6	226.	8.2	230.	2.4	241.	6.5	234.	6.4	244.	4.2	241.	6.1	243.	6.7	240.
4.1	392.	7.2	347.	10.5	302.	13.4	339.	15.3	317.	17.7	294.	18.1	289.	16.9	287.	17.3	288.	17.2	288.	17.1	205.

Fig. 17 TABULATED MEASURED DATA (TRANSMIT ANT, HOR POL, E-0)

SLAVE ANTENNA AO RANGE VALUES

-20.		-16.		-12.		-8.		-4.		0.		4.		8.		12.		16.		20.	
SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE
14.1	206.	13.3	250.	13.3	250.	15.9	204.	18.0	209.	18.7	198.	17.7	202.	10.9	215.	21.3	217.	21.1	221.	22.3	228.
14.1	196.	15.7	219.	14.7	198.	16.6	179.	17.3	191.	19.8	126.	23.7	162.	23.8	183.	21.4	288.	20.2	204.	22.7	181.
14.0	81.	19.3	94.	21.2	26.	22.2	23.	21.8	19.	23.0	12.	26.4	21.	23.4	32.	20.7	36.	26.2	41.	26.2	30.
20.7	12.	21.3	24.	22.0	14.	23.4	20.	24.5	16.	23.1	16.	26.4	26.	26.7	28.	26.9	36.	26.7	42.	27.4	43.
16.6	325.	15.9	344.	15.7	334.	15.7	336.	16.3	331.	16.7	326.	16.4	336.	17.1	340.	18.2	344.	17.9	355.	18.7	358.
13.9	279.	14.0	314.	12.5	306.	13.3	301.	14.9	295.	13.5	288.	19.1	298.	15.3	303.	16.3	300.	16.1	310.	16.2	304.
13.0	292.	12.9	284.	12.1	286.	12.0	284.	12.0	274.	13.6	271.	13.7	265.	14.6	288.	16.0	290.	16.0	304.	16.0	300.
17.6	276.	18.6	302.	20.1	314.	21.2	322.	22.6	318.	23.3	322.	23.4	334.	24.0	264.	25.4	344.	23.4	354.	25.7	357.
14.3	264.	13.6	278.	14.9	270.	13.8	274.	13.7	271.	13.7	272.	16.2	285.	16.3	280.	16.2	299.	17.3	315.	17.4	307.
9.9	202.	11.2	196.	11.0	185.	11.6	182.	10.4	180.	20.9	176.	11.0	180.	10.4	198.	17.9	180.	12.3	190.	15.7	186.
12.4	157.	12.9	134.	14.6	140.	14.4	150.	13.4	143.	17.8	142.	17.1	194.	10.4	156.	18.6	133.	18.3	166.	20.3	160.
9.9	141.	13.3	114.	15.5	85.	14.7	211.	14.4	88.	17.2	70.	18.3	75.	18.5	47.	19.7	81.	20.9	40.	19.8	28.
16.6	166.	15.9	76.	14.4	226.	18.1	82.	19.1	201.	16.1	187.	13.8	193.	16.1	194.	16.7	195.	17.6	193.	16.7	196.
26.1	180.	26.3	235.	23.4	190.	26.8	188.	27.6	181.	28.3	182.	26.7	186.	28.7	189.	28.3	194.	28.8	200.	28.9	194.
32.1	192.	33.1	202.	34.6	192.	35.4	200.	35.4	190.	39.6	193.	36.7	195.	37.8	202.	37.8	202.	37.1	208.	37.3	226.
33.1	180.	33.1	184.	34.6	174.	35.3	184.	33.9	171.	36.3	178.	36.6	178.	37.8	184.	37.8	202.	37.1	192.	37.4	188.
22.8	48.	23.6	33.	23.2	30.	24.5	31.	25.7	43.	26.1	40.	30.6	40.	26.8	31.	37.2	183.	26.8	34.	27.1	16.
10.7	152.	11.8	284.	10.3	281.	10.5	279.	11.0	296.	13.7	296.	11.0	309.	7.9	304.	27.2	41.	9.7	315.	3.6	266.
10.0	148.	10.8	250.	9.8	246.	10.1	252.	9.2	260.	9.3	250.	7.7	271.	8.1	266.	8.7	301.	7.6	263.	8.8	292.
13.0	163.	12.6	212.	11.7	202.	13.2	213.	11.1	208.	14.0	213.	12.6	213.	12.6	220.	7.4	267.	10.6	216.	14.6	211.
15.9	174.	16.1	190.	15.2	176.	15.9	184.	16.0	182.	17.1	177.	15.8	187.	13.7	197.	14.4	219.	16.9	190.	14.3	193.
13.7	132.	14.2	129.	15.6	108.	16.2	121.	16.0	108.	14.2	110.	18.8	106.	17.6	116.	16.0	107.	17.5	118.	18.8	99.
23.9	81.	23.8	86.	24.3	70.	23.1	63.	25.8	66.	23.7	70.	26.1	63.	25.3	74.	17.2	115.	25.9	69.	26.2	70.
30.6	78.	31.7	82.	32.3	71.	32.7	88.	33.0	64.	33.6	68.	33.7	68.	33.2	72.	26.3	70.	33.2	71.	32.9	71.
35.3	66.	35.9	69.	36.4	60.	36.7	76.	36.6	56.	37.2	56.	37.6	38.	36.7	40.	33.5	72.	37.3	57.	37.0	39.
33.4	52.	34.2	38.	34.7	48.	34.9	64.	35.3	44.	33.3	44.	36.0	47.	34.8	50.	37.3	60.	33.6	47.	33.4	60.
27.6	353.	26.2	319.	25.3	312.	26.0	334.	24.4	312.	24.3	312.	23.6	333.	22.8	308.	13.4	90.	22.9	297.	22.9	280.
19.6	135.	19.3	142.	18.9	232.	23.1	293.	19.8	118.	23.5	227.	21.2	290.	23.6	241.	23.4	313.	22.3	244.	22.0	220.
21.7	288.	21.4	272.	20.9	222.	19.4	250.	19.2	250.	19.6	244.	20.8	247.	20.6	239.	22.4	204.	22.1	298.	21.4	247.
12.3	229.	12.2	184.	17.1	104.	14.0	200.	13.7	219.	16.4	200.	16.4	228.	17.0	299.	23.6	249.	14.5	243.	21.1	135.
9.6	275.	16.4	92.	11.5	304.	15.4	14.	10.8	158.	17.4	31.	16.4	133.	13.3	146.	17.2	236.	11.4	198.	17.6	7.
15.2	218.	19.1	222.	18.9	199.	18.8	206.	17.5	167.	16.9	190.	19.7	126.	19.9	70.	19.1	97.	17.9	131.	3.3	243.
16.0	156.	17.0	120.	19.9	67.	19.3	94.	19.9	84.	23.4	48.	18.3	330.	14.6	323.	12.9	331.	19.6	40.	12.3	284.
18.6	108.	20.0	64.	17.5	344.	19.5	49.	18.1	9.	18.8	338.	10.4	337.	12.7	304.	12.1	214.	16.3	349.	19.8	42.
24.9	139.	25.9	130.	25.0	110.	24.8	316.	23.5	87.	23.9	86.	23.3	78.	22.1	94.	21.8	43.	20.8	50.	20.6	38.
27.6	59.	28.1	83.	28.2	70.	28.8	83.	28.0	56.	27.8	51.	27.4	42.	23.9	38.	22.1	60.	25.9	27.	24.0	24.
38.1	76.	37.1	72.	37.4	62.	37.2	70.	36.0	46.	36.3	46.	36.4	48.	34.0	39.	26.0	32.	35.0	26.	0.	0.
40.6	54.	40.7	53.	40.9	33.	40.8	46.	40.6	27.	40.3	23.	43.0	20.	38.3	16.	35.7	32.	38.1	7.	0.	0.
40.1	37.	46.5	34.	40.7	27.	40.8	32.	39.8	12.	40.3	10.	43.1	6.	38.3	2.	38.4	14.	38.2	350.	33.8	12.
39.1	34.	39.5	36.	39.7	32.	40.0	36.	39.8	16.	39.3	14.	39.4	0.	38.2	6.	29.8	359.	38.1	354.	32.6	49.
37.3	28.	37.8	38.	37.9	45.	38.0	58.	37.0	44.	37.9	44.	36.9	46.	36.0	32.	38.3	3.	35.8	16.	30.5	50.
37.1	190.	37.3	217.	37.3	80.	37.3	98.	36.2	84.	36.4	66.	36.1	82.	34.9	65.	34.4	20.	33.6	47.	13.8	282.
32.7	131.	33.2	136.	33.0	344.	35.6	57.	32.8	72.	33.1	60.	32.6	78.	31.7	79.	30.6	99.	31.3	66.	20.3	266.
24.8	309.	24.8	335.	22.9	228.	22.8	291.	21.9	280.	21.3	204.	20.6	292.	19.0	304.	31.8	71.	16.7	288.	30.4	276.
32.6	311.	32.8	312.	33.1	306.	32.8	307.	30.9	298.	32.0	283.	31.8	282.	29.8	280.	10.3	282.	29.4	266.	33.4	267.
39.3	322.	39.5	321.	39.4	315.	39.5	310.	38.2	295.	30.2	294.	30.7	294.	30.1	292.	30.0	272.	37.3	276.	20.8	[illegible]
37.8	320.	38.0	338.	38.0	304.	38.0	306.	36.9	282.	37.7	282.	37.4	283.	36.3	280.	37.6	284.	33.7	308.	16.8	[illegible]
18.5	136.	20.0	196.	22.5	28.	20.0	145.	20.1	194.	21.0	193.	21.2	195.	20.2	208.	36.2	278.	19.1	188.	5.6	[illegible]
19.1	342.	18.4	330.	14.3	294.	18.1	319.	19.0	343.	20.4	346.	19.7	340.	22.1	33.	19.7	187.	20.3	24.	10.8	216.
13.0	278.	12.1	294.	9.5	266.	9.3	288.	10.6	297.	9.4	301.	8.2	308.	8.8	321.	10.0	350.	8.3	313.	18.7	237.
18.4	218.	14.8	234.	14.0	252.	13.0	241.	10.5	236.	11.0	244.	9.8	251.	9.9	260.	9.5	316.	10.5	267.	18.4	139.
22.5	218.	21.6	218.	20.9	215.	20.4	218.	18.6	205.	19.4	204.	18.4	234.	17.0	214.	9.8	263.	15.9	200.	21.1	[illegible]
23.9	216.	23.5	217.	22.9	210.	22.7	212.	21.0	195.	23.8	193.	23.3	193.	19.0	190.	16.1	213.	17.7	105.	21.6	[illegible]
19.8	188.	19.7	177.	19.4	143.	19.1	193.	17.9	126.	18.3	123.	19.2	90.	19.0	180.	18.2	158.	17.5	115.	17.0	[illegible]
13.2	70.	14.6	64.	15.2	24.	17.2	28.	16.8	6.	17.0	358.	17.6	347.	17.3	349.	18.4	98.	18.8	354.	14.5	302.
20.0	16.	20.5	11.	20.0	0.	19.2	3.	19.6	342.	15.8	344.	19.7	353.	19.6	334.	18.3	363.	19.8	319.	8.3	296.
16.9	339.	16.6	334.	15.9	332.	15.8	345.	13.4	314.	15.7	320.	13.3	310.	12.3	322.	18.4	328.	12.6	308.	6.9	312.
13.6	286.	15.3	296.	12.6	306.	12.0	326.	11.6	288.	10.1	319.	13.6	301.	8.1	320.	13.8	316.	6.7	308.	15.3	349.
10.9	236.	10.8	238.	9.8	280.	9.2	289.	7.2	259.	9.2	313.	7.4	295.	6.9	328.	8.1	308.	3.0	317.	10.9	332.
8.1	168.	10.2	168.	6.5	224.	7.2	211.	6.0	204.	10.5	313.	10.7	296.	12.6	0.	7.4	303.	14.1	339.	18.0	60.

Fig. 18 TABULATED MEASURED DATA (SLAVE ANT, HOR POL, E-0)

DAY NUMBER- A POLARIZATION- HORIZ ELEVATION- 0

-20.		-16.		-12.		-8.		-4.		0.		4.		8.		12.		16.		20.	
DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI
10.4	8.	11.7	40.	11.8	32.	8.4	6.	7.4	171.	6.6	16.	6.5	26.	6.0	59.	3.2	41.	2.9	41.	2.5	44.
3.8	100.	2.9	130.	1.4	88.	1.5	50.	9.0	90.	0.3	30.	0.1	82.	0.9	118.	2.5	168.	0.8	175.	1.5	107.
13.1	45.	7.8	18.	5.4	4.	5.9	13.	5.1	1.	3.1	2.	2.5	6.	1.7	24.	1.2	25.	1.7	36.	1.1	28.
7.4	28.	7.1	8.	6.0	5.	4.4	2.	3.5	16.	2.1	12.	1.1	25.	1.0	31.	0.9	48.	1.2	57.	0.5	41.
4.7	9.	5.0	30.	4.5	22.	5.4	18.	3.8	27.	5.1	24.	2.8	34.	2.3	48.	1.7	44.	1.5	49.	1.4	46.
4.9	20.	4.2	38.	4.8	26.	5.6	13.	3.8	25.	2.9	23.	2.7	55.	2.2	43.	1.5	30.	2.2	48.	1.3	42.
5.6	44.	5.4	6.	7.5	4.	6.7	1.	5.6	2.	5.1	4.	5.1	17.	5.4	36.	2.5	22.	2.5	57.	3.8	34.
7.8	27.	7.4	27.	9.8	9.	5.2	7.	3.5	4.	3.1	10.	2.6	17.	1.9	30.	0.7	53.	6.5	48.	8.	45.
0.8	55.	1.8	64.	4.7	67.	3.0	62.	6.2	51.	6.4	69.	8.7	75.	7.2	95.	8.5	96.	7.2	115.	9.1	109.
10.6	38.	9.0	58.	9.2	30.	8.1	26.	9.6	32.	8.0	40.	8.3	92.	8.4	62.	9.5	52.	8.1	62.	3.7	48.
9.5	1.	9.0	9.	7.3	6.	7.1	2.	5.0	11.	5.4	14.	3.1	38.	2.5	32.	2.1	26.	2.9	36.	1.1	32.
4.8	7.	2.2	22.	0.2	30.	1.1	16.	0.4	8.	0.2	22.	2.1	15.	1.8	97.	3.4	6.	3.9	92.	2.5	70.
4.5	10.	4.3	32.	5.6	63.	2.0	93.	3.6	99.	3.1	43.	3.7	47.	5.7	54.	2.2	47.	2.0	47.	3.0	50.
4.5	15.	4.1	49.	3.4	2.	2.2	1.	2.9	14.	3.0	14.	3.	22.	1.2	25.	1.4	27.	1.1	35.	1.1	51.
4.2	16.	4.4	2.	2.7	2.	1.7	2.	1.3	15.	1.1	16.	0.5	23.	0.2	28.	0.2	29.	0.2	31.	0.1	30.
3.1	8.	3.3	1.	1.3	4.	0.2	0.	0.2	7.	0.8	20.	1.1	18.	1.1	25.	0.9	64.	1.2	36.	1.3	28.
1.7	17.	1.3	28.	2.2	4.	0.4	5.	0.3	24.	0.3	58.	0.5	34.	0.6	36.	10.6	148.	0.6	42.	0.2	66.
1.2	88.	1.6	44.	0.8	43.	0.	33.	1.1	56.	0.7	94.	2.5	87.	2.0	75.	21.5	157.	0.2	84.	3.2	30.
4.0	64.	4.2	41.	5.7	42.	4.6	42.	6.4	70.	5.5	62.	6.0	77.	5.9	76.	7.2	113.	7.6	74.	7.2	68.
5.0	35.	5.1	24.	5.3	19.	5.0	25.	6.4	39.	3.5	42.	4.5	47.	4.5	54.	9.5	101.	4.4	47.	1.8	44.
3.9	15.	2.6	8.	3.0	0.	2.5	6.	2.5	23	0.7	18.	1.8	27.	1.8	42.	5.8	93.	1.4	32.	2.5	55.
0.7	5.	0.2	15.	1.5	9.	3.6	1.	2.4	22	0.6	22.	1.7	32.	2.8	22.	1.6	112.	2.5	25.	4.6	11.
0.3	4.	0.2	10.	0.2	0.	1.1	13.	2.8	14.	2.6	18.	3.2	17.	1.4	30.	6.5	71.	2.1	21.	1.0	22.
1.3	4.	0.1	18.	0.6	15.	2.0	26.	1.2	22.	1.6	50.	2.2	28.	2.4	50.	5.5	33.	1.7	53.	1.2	32.
0.4	8.	1.0	17.	0.5	15.	1.2	28.	1.7	16.	1.8	28.	3.3	55.	1.5	35.	2.1	49.	1.6	31.	1.5	83.
0.	12.	0.7	25.	1.5	21.	2.1	37.	2.7	21.	2.5	55.	3.5	40.	2.4	41.	4.5	54.	2.8	35.	2.0	37.
2.4	129.	0.6	84.	1.7	114.	2.3	128.	0.7	82.	1.7	122.	3.6	170.	0.1	108.	12.8	132.	0.1	95.	0.6	92.
2.5	9.	3.1	42.	2.9	83.	7.2	90.	5.8	62.	6.8	91.	5.7	13.	3.4	49.	0.1	147.	0.6	93.	0.7	70.
1.8	29.	1.1	27.	5.9	93.	2.8	21.	4.2	7.	3.7	18.	1.7	24.	1.7	39.	0.	14.	0.1	30.	1.3	27.
1.1	4.	2.6	42.	0.7	159.	1.2	22.	5.7	5.	2.8	14.	2.8	11.	5.3	27.	6.4	51.	1.9	21.	0.3	75.
1.2	84.	10.3	96.	6.7	148.	8.6	119.	8.0	8.	14.2	115.	14.5	1.	15.1	0.	17.0	98.	11.3	8.	16.2	115.
1.5	92.	3.1	85.	3.1	60.	3.5	77.	1.9	40.	2.5	72.	5.8	4.	4.0	44.	5.4	22.	5.6	3.	0.6	127.
0.3	84.	4.9	15.	6.5	37.	4.9	12.	5.0	2.	5.6	47.	2.1	102.	0.9	121.	4.0	92.	5.5	52.	4.2	140.
3.2	154.	0.6	110.	1.0	24.	0.9	57.	1.1	81.	1.0	61.	3.4	40.	5.4	22.	3.9	52.	1.4	87.	4.0	160.
17.1	13.	14.7	24.	16.0	60.	16.3	70.	15.5	113.	14.4	142.	16.3	151.	15.5	136.	14.5	171.	13.5	152.	15.3	130.
3.6	89.	5.1	66.	4.2	46.	4.6	82.	3.8	82.	2.9	85.	5.7	86.	1.2	73.	2.1	100.	1.3	59.	0.3	55.
5.0	68.	5.1	56.	4.4	54.	4.1	72.	2.9	64.	2.9	68.	3.2	66.	2.9	66.	7.6	61.	1.6	50.	33.5	24.
4.8	64.	5.4	68.	5.2	58.	5.9	79.	4.5	79.	4.4	79.	5.2	83.	2.5	76.	0.	95.	2.6	61.	25.8	58.
2.8	75.	4.4	45.	3.6	69.	3.5	78.	2.5	77.	2.8	77.	2.5	74.	1.1	71.	0.7	86.	0.8	56.	2.5	79.
1.1	67.	1.4	58.	2.5	66.	2.5	74.	1.7	71.	0.9	74.	2.5	67.	6.	68.	0.7	59.	0.1	49.	5.5	106.
0.9	42.	1.6	45.	1.5	64.	1.6	76.	0.3	77.	1.2	84.	0.8	80.	6.7	79.	1.5	58.	0.9	50.	0.4	95.
1.5	162.	2.3	143.	2.5	94.	2.4	132.	1.3	96.	1.5	111.	1.2	101.	0.5	80.	1.4	48.	1.8	61.	19.7	64.
1.4	87.	1.2	136.	1.2	66.	1.6	101.	0.5	84.	2.5	144.	1.3	93.	0.4	99.	2.5	74.	0.9	70.	4.2	76.
1.5	22.	3.	80.	2.0	171.	1.7	153.	0.4	72.	3.2	2.	0.4	94.	5.0	94.	11.2	115.	4.6	70.	15.5	91.
2.7	74.	2.7	48.	3.5	72.	2.9	80.	0.9	62.	1.9	74.	3.1	79.	0.3	73.	11.9	76.	1.0	68.	5.3	59.
2.5	71.	2.5	64.	3.0	69.	5.4	76.	1.2	57.	2.4	70.	2.5	72.	1.3	72.	6.9	92.	0.5	35.	16.8	97.
4.4	77.	4.6	66.	4.6	72.	5.1	76.	5.3	64.	4.0	75.	4.6	79.	5.8	76.	3.7	77.	1.9	60.	19.6	46.
5.2	147.	6.2	10.	9.8	147.	4.2	34.	6.4	26.	5.7	22.	6.3	15.	5.9	34.	20.0	98.	5.0	40.	9.0	66.
5.1	148.	4.7	134.	3.1	135.	4.5	134.	0.0	178.	6.9	170.	6.6	169.	9.0	138.	5.5	57.	7.3	132.	5.5	71.
7.4	104.	5.2	108.	3.6	94.	5.7	123.	4.5	172.	2.9	155.	2.1	170.	4.5	173.	12.2	121.	2.3	155.	11.9	75.
2.1	23.	0.8	27.	0.8	39.	0.6	55.	1.4	133.	5.4	156.	1.3	65.	0.9	103.	2.5	166.	1.2	125.	5.1	28.
5.3	49.	4.5	40.	5.1	50.	3.7	56.	5.2	53.	1.6	160.	3.2	65.	2.1	70.	3.9	128.	1.4	62.	4.0	76.
7.6	78.	8.0	70.	7.5	74.	7.0	77.	5.5	68.	7.1	17.	6.3	74.	5.1	70.	1.0	101.	5.9	62.	1.9	194.
5.6	152.	11.2	97.	9.1	79.	7.7	101.	5.1	76.	15.9	5.	2.2	73.	6.4	60.	0.5	179.	5.7	76.	2.5	22.
6.7	134.	5.3	114.	4.4	90.	3.6	99.	5.0	70.	5.8	74.	2.2	77.	3.4	82.	0.8	160.	2.5	62.	4.5	34.
0.1	96.	1.4	84.	0.5	82.	1.3	87.	0.3	66.	0.9	88.	3.5	73.	0.5	76.	9.2	85.	1.4	29.	12.7	36.
0.8	71.	2.8	62.	0.9	69.	0.3	86.	0.2	54.	1.9	85.	3.5	71.	2.5	60.	2.2	76.	2.7	54.	9.8	61.
5.9	50.	6.0	51.	1.4	62.	2.1	92.	0.9	49.	3.6	88.	0.6	73.	2.5	70.	3.6	82.	3.9	68.	5.1	114.
4.1	14.	4.1	6.	3.1	38.	3.6	65.	1.0	29.	6.8	72.	3.9	43.	0.5	84.	1.9	67.	2.3	74.	12.8	92.
4.0	126.	3.0	179.	12.0	78.	6.4	98.	9.5	111.	7.2	21.	7.4	7.	4.3	73.	9.9	20.	3.1	71.	6.3	155.

Fig. 19 TABULATED DIFFERENTIAL DATA (HOR POL, E-0)

DAY NUMBER- 4 POLARIZATION- HORIZ ELEVATION- 20

TRANS ANTENNA 60 RANGE VALUES

-20.		-16.		-12.		-8.		-4.		0.		4.		8.		12.		16.		20.	
SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE
23.5	132.	23.4	154.	24.5	142.	24.5	142.	24.5	150.	24.8	156.	24.6	189.	26.1	185.	24.7	151.	24.3	196.	26.4	237.
21.0	196.	17.6	144.	20.3	192.	22.8	228.	22.4	223.	22.6	294.	18.3	127.	18.6	132.	16.9	132.	18.7	55.	18.1	126.
26.6	24.	23.5	34.	25.3	26.	27.4	31.	26.6	26.	27.0	24.	26.6	32.	26.7	18.	27.0	28.	27.2	18.	26.9	30.
25.6	129.	24.9	165.	24.3	124.	26.0	222.	24.9	173.	23.5	216.	28.3	12.	25.2	2.	27.7	28.	25.1	18.	25.1	35.
23.6	288.	18.2	277.	20.2	295.	21.1	310.	10.3	206.	22.0	344.	23.7	300.	20.9	306.	21.3	317.	21.0	310.	21.0	312.
14.1	238.	19.1	294.	14.2	246.	14.8	265.	12.3	242.	13.6	251.	18.0	275.	17.4	274.	17.6	306.	17.4	280.	15.1	280.
15.6	242.	13.9	252.	15.8	240.	16.9	251.	16.3	253.	17.6	244.	17.8	269.	15.7	269.	18.2	252.	18.3	277.	15.7	278.
20.6	117.	23.9	32.	20.2	100.	20.5	166.	27.4	0.	25.1	337.	28.8	318.	28.6	311.	25.6	304.	28.4	315.	28.5	308.
12.5	80.	12.3	87.	16.6	48.	11.0	106.	10.0	106.	13.7	94.	5.6	209.	9.5	207.	12.0	200.	10.3	204.	12.3	234.
25.2	333.	19.3	132.	19.6	137.	19.6	132.	20.7	133.	19.5	134.	18.2	142.	15.4	146.	20.4	159.	19.6	155.	15.9	156.
25.8	342.	26.9	286.	26.6	342.	25.6	243.	26.3	354.	24.3	42.	21.3	143.	21.3	137.	21.6	181.	21.4	145.	21.6	149.
18.8	196.	13.3	167.	16.7	182.	14.4	158.	20.7	218.	23.9	296.	16.3	118.	18.7	115.	15.7	128.	15.4	139.	15.9	124.
19.4	154.	19.7	156.	18.6	139.	19.8	156.	20.5	159.	20.5	162.	19.6	136.	20.1	155.	20.7	166.	21.2	167.	20.8	168.
29.3	172.	30.3	172.	30.2	174.	30.2	172.	30.9	173.	30.5	175.	33.4	172.	30.0	172.	30.1	158.	30.1	186.	30.3	188.
37.2	166.	36.9	172.	37.2	172.	37.5	168.	37.2	171.	37.2	176.	37.3	186.	37.2	186.	37.2	199.	37.5	198.	37.6	196.
37.2	291.	37.1	329.	37.3	353.	36.9	242.	37.1	281.	37.5	306.	36.5	170.	36.4	168.	36.3	155.	36.3	151.	36.6	176.
22.4	89.	22.1	112.	22.1	105.	22.1	106.	22.0	128.	22.0	125.	26.4	16.	26.4	12.	25.2	28.	25.1	57.	26.1	15.
13.4	19.	15.0	1.	15.9	0.	19.0	358.	19.4	296.	16.7	0.	8.4	233.	7.6	220.	10.4	235.	9.0	235.	6.1	213.
11.6	163.	11.0	166.	13.3	162.	13.0	168.	13.0	168.	12.8	172.	15.0	194.	18.6	200.	15.9	206.	14.4	206.	18.0	202.
17.0	146.	13.8	124.	16.7	141.	16.5	146.	17.1	146.	17.0	181.	17.1	176.	17.7	174.	10.2	105.	15.2	184.	15.2	181.
14.1	113.	18.6	59.	19.2	126.	18.6	130.	18.0	115.	18.4	126.	18.7	166.	15.0	166.	19.1	176.	18.6	176.	20.5	177.
14.3	142.	18.7	34.	19.3	223.	18.6	220.	15.5	167.	20.0	236.	14.8	107.	14.0	105.	14.2	102.	13.5	114.	13.7	106.
21.0	69.	22.8	70.	23.3	72.	23.8	65.	23.1	70.	22.8	73.	23.5	56.	23.3	53.	23.6	74.	23.5	71.	23.5	72.
31.0	48.	31.2	52.	31.8	51.	32.0	46.	31.6	50.	31.7	32.	31.6	47.	31.8	45.	31.6	63.	31.8	60.	31.8	67.
34.0	14.	35.4	16.	33.5	17.	35.8	12.	33.6	16.	33.8	20.	35.5	16.	35.6	32.	35.5	46.	38.7	46.	35.7	69.
32.1	35.	31.0	120.	33.1	51.	32.1	92.	31.9	92.	31.5	151.	33.6	16.	33.4	15.	30.8	25.	33.8	25.	33.7	30.
26.8	326.	24.6	36.	26.2	28.	25.9	56.	25.4	46.	24.2	91.	24.3	238.	25.8	203.	24.3	190.	26.7	221.	25.3	215.
24.7	211.	23.2	223.	24.9	220.	23.2	222.	24.4	222.	23.3	108.	23.7	185.	27.6	260.	27.9	327.	22.7	151.	22.2	161.
20.4	67.	19.7	123.	19.9	120.	20.8	82.	20.4	164.	19.6	106.	23.2	225.	23.0	225.	22.9	246.	15.5	180.	21.6	219.
20.8	302.	22.1	252.	20.3	276.	21.1	296.	18.5	232.	21.4	295.	12.8	226.	11.9	217.	11.0	229.	2.9	132.	10.3	205.
8.9	84.	11.2	66.	7.3	87.	8.8	88.	8.7	84.	8.4	92.	3.1	158.	1.7	144.	7.8	125.	8.4	91.	10.6	112.
16.3	60.	19.7	32.	17.3	61.	18.0	68.	18.1	58.	18.0	57.	14.8	135.	14.2	131.	16.1	131.	14.0	121.	16.6	112.
14.1	114.	21.1	220.	13.7	123.	13.3	134.	13.0	76.	22.2	330.	13.6	110.	14.1	55.	14.6	73.	13.7	56.	17.1	60.
4.1	65.	19.3	327.	3.1	104.	9.2	198.	6.2	68.	8.4	48.	17.3	13.	18.9	283.	16.3	265.	17.3	273.	15.3	240.
17.7	286.	6.3	78.	18.3	346.	8.3	74.	10.3	205.	6.0	125.	11.5	225.	6.7	190.	6.5	138.	8.5	182.	6.7	158.
23.1	358.	23.6	359.	23.6	354.	23.4	338.	24.0	0.	23.2	6.	24.1	337.	23.4	340.	23.5	355.	23.3	2.	24.3	354.
31.3	334.	33.4	330.	34.0	348.	33.3	346.	33.2	348.	33.7	354.	32.8	345.	33.1	347.	33.2	2.	33.3	350.	35.4	1.
35.5	294.	35.5	296.	34.5	243.	33.8	293.	33.6	244.	32.3	12.	33.9	313.	33.6	316.	34.6	325.	35.2	327.	36.3	328.
37.4	287.	37.3	288.	37.6	286.	37.3	287.	37.6	268.	37.5	292.	37.3	305.	37.4	305.	37.2	316.	37.3	313.	37.3	318.
38.1	280.	38.1	278.	38.0	280.	38.1	282.	38.1	278.	38.3	285.	38.2	312.	38.2	315.	35.1	324.	37.6	320.	38.2	322.
36.2	338.	36.5	2.	37.0	348.	36.1	61.	36.7	338.	35.4	310.	36.8	332.	37.0	336.	36.9	339.	36.0	336.	37.7	243.
34.4	26.	34.6	19.	34.5	38.	34.3	36.	34.8	23.	33.7	82.	33.1	339.	38.4	342.	35.1	341.	38.0	342.	34.4	42.
30.2	33.	31.3	30.	31.2	64.	30.9	58.	31.4	31.	30.6	116.	31.7	296.	31.3	199.	30.6	158.	30.6	223.	32.1	25.
23.9	337.	26.6	280.	24.9	10.	24.6	17.	24.7	30.	22.4	86.	23.5	56.	26.9	327.	29.4	285.	26.4	311.	23.1	246.
28.2	219.	30.1	222.	30.9	227.	30.3	223.	30.7	226.	30.0	212.	29.8	222.	30.5	230.	30.3	231.	30.0	230.	30.3	229.
36.6	212.	33.8	211.	36.6	212.	36.6	214.	36.8	214.	36.8	217.	36.7	234.	36.5	242.	36.9	243.	36.6	240.	36.5	241.
34.6	280.	34.7	337.	33.2	302.	35.1	325.	35.0	310.	33.3	327.	33.5	223.	33.8	227.	33.7	226.	33.6	223.	33.7	226.
15.5	186.	16.4	188.	15.9	187.	13.1	188.	16.8	188.	16.0	186.	17.7	160.	13.5	167.	13.7	196.	15.9	192.	16.9	183.
17.8	94.	18.0	26.	17.3	46.	15.8	54.	18.5	33.	14.2	77.	14.3	183.	14.3	190.	14.7	192.	14.4	190.	14.1	190.
12.0	40.	12.7	40.	6.5	80.	3.4	108.	6.7	94.	3.0	117.	7.7	150.	3.2	171.	8.2	182.	5.1	168.	6.8	167.
11.3	162.	11.2	139.	17.2	166.	16.0	40.	14.3	181.	17.3	29.	11.7	166.	12.5	190.	13.4	195.	13.5	151.	12.6	184.
16.6	113.	13.6	124.	16.1	122.	13.1	122.	14.9	123.	15.5	134.	13.3	176.	17.9	166.	16.7	164.	16.4	168.	17.4	170.
16.9	136.	20.2	194.	0.	0.	23.9	276.	24.8	276.	23.8	330.	14.3	135.	18.0	135.	15.1	140.	15.7	140.	18.2	141.
11.0	198.	16.1	227.	19.0	237.	19.7	275.	18.3	236.	23.1	292.	8.3	84.	8.4	70.	8.3	70.	8.0	65.	10.4	65.
18.4	230.	9.8	207.	19.1	237.	18.4	262.	16.4	246.	17.4	262.	20.6	290.	20.6	296.	20.0	296.	20.5	297.	19.5	296.
17.4	216.	17.1	238.	18.4	232.	18.2	233.	17.3	229.	18.1	237.	23.4	267.	19.8	275.	20.0	275.	20.0	272.	20.1	272.
3.7	108.	5.4	143.	4.8	174.	6.1	183.	0.1	290.	6.2	188.	15.2	256.	16.3	260.	16.1	262.	14.7	237.	15.3	238.
12.2	214.	18.4	356.	1.7	120.	3.3	166.	6.1	169.	5.3	168.	11.5	240.	10.9	232.	11.5	235.	11.4	234.	10.1	238.
2.2	82.	3.2	95.	11.0	40.	1.3	79.	4.5	63.	1.9	77.	6.2	232.	6.7	227.	7.3	224.	8.1	232.	6.8	233.
19.3	285.	20.1	322.	18.3	288.	19.1	288.	16.4	295.	18.2	302.	14.6	288.	14.7	308.	15.5	304.	15.7	302.	18.0	318.

Fig. 20 TABULATED MEASURED DATA (TRANSMIT ANT, HOR POL, E 20)

SLAVE ANTENNA 60 RANGE VALUES

-20.		-16.		-12.		-8.		-4.		0.		4.		8.		12.		16.		20.	
SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE
6.7	141.	9.8	141.	11.5	142.	13.2	144.	6.7	150.	16.8	150.	18.2	191.	19.8	192.	21.2	218.	21.4	214.	22.0	222.
14.5	44.	17.8	20.	21.9	304.	19.3	237.	16.0	216.	19.8	244.	18.3	184.	17.1	183.	16.7	196.	17.8	196.	16.1	[illegible]
10.4	239.	16.9	26.	19.3	359.	18.0	21.	18.0	13.	21.3	23.	22.3	28.	22.6	35.	23.3	61.	22.0	58.	23.9	[illegible]
13.6	262.	16.9	277.	18.7	281.	19.2	254.	20.6	44.	24.8	317.	25.4	14.	26.1	26.	26.3	52.	25.8	46.	27.2	94.
10.0	235.	10.5	239.	2.1	106.	14.6	274.	21.0	244.	16.4	274.	19.4	316.	19.6	313.	20.5	339.	20.6	338.	21.0	334.
7.3	196.	9.3	262.	13.4	240.	9.7	225.	13.4	276.	10.8	234.	16.5	278.	16.4	278.	16.6	291.	16.6	284.	16.5	277.
6.6	126.	6.1	141.	6.5	192.	7.0	193.	10.4	232.	10.1	216.	15.2	263.	13.6	262.	15.9	279.	15.3	268.	15.6	267.
16.3	250.	17.8	242.	17.3	19.	21.3	308.	10.5	207.	22.5	318.	22.3	300.	22.7	290.	23.0	271.	20.0	197.	20.7	90.
7.5	160.	8.7	176.	7.3	198.	7.0	193.	20.5	301.	6.5	185.	14.8	257.	15.8	260.	9.9	190.	18.7	300.	18.1	278.
7.4	99.	8.5	99.	8.2	126.	10.6	130.	7.7	193.	13.8	136.	14.8	160.	16.9	159.	17.3	174.	17.0	178.	17.4	182.
18.2	321.	16.8	15.	14.0	70.	14.8	70.	12.6	129.	18.3	65.	17.4	134.	18.5	146.	18.9	165.	19.0	163.	19.8	175.
6.6	143.	7.6	143.	9.4	165.	9.4	162.	19.0	39.	10.7	116.	13.8	117.	12.2	127.	10.5	146.	11.1	146.	11.8	156.
12.7	137.	15.0	146.	15.2	152.	16.5	162.	11.4	92.	17.2	162.	17.3	162.	18.3	169.	18.9	188.	17.6	178.	17.2	183.
23.1	151.	23.9	154.	25.4	164.	26.5	171.	17.2	159.	28.0	187.	28.1	178.	28.7	186.	29.8	207.	28.2	207.	29.2	231.
[illegible]	[illegible]	31.9	150.	33.2	162.	34.4	170.	27.5	180.	35.8	[illegible]	36.4	191.	36.8	200.	37.1	218.	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	32.7	12.	34.5	37.	34.6	32.	35.3	178.	[illegible]	[illegible]	35.3	178.	36.4	186.	36.4	202.	[illegible]	[illegible]	[illegible]	[illegible]
18.0	132.	20.3	139.	21.6	172.	22.4	148.	[illegible]	[illegible]	23.4	120.	24.2	77.	25.3	43.	24.3	94.	24.7	78.	24.6	98.
6.7	88.	9.7	69.	14.9	22.	18.4	333.	22.6	119.	16.9	202.	14.2	263.	11.2	240.	12.0	247.	16.3	278.	13.6	266.
14.3	230.	9.3	180.	7.8	164.	9.6	168.	17.1	349.	9.6	181.	12.3	216.	12.9	213.	13.2	226.	14.3	231.	13.8	208.
9.6	126.	10.4	128.	10.8	134.	13.6	138.	9.9	176.	13.8	193.	15.7	189.	16.8	198.	16.8	210.	17.6	208.	16.5	188.
13.9	123.	15.8	118.	16.4	116.	16.4	124.	13.8	154.	17.7	140.	17.3	170.	17.6	174.	17.6	192.	17.2	190.	17.8	173.
18.5	352.	17.8	87.	19.2	349.	17.2	30.	16.8	129.	17.9	98.	14.2	110.	14.3	115.	13.5	126.	13.8	128.	13.3	117.
18.5	54.	22.1	60.	22.5	75.	23.0	76.	16.7	49.	23.9	85.	24.1	70.	24.9	77.	23.9	101.	22.7	89.	23.2	72.
27.4	40.	30.9	42.	30.9	55.	31.9	61.	24.0	82.	32.4	72.	32.9	68.	33.1	72.	32.8	94.	31.3	83.	32.2	60.
32.9	9.	34.6	13.	35.4	24.	34.1	28.	32.3	64.	37.1	39.	37.1	53.	36.9	58.	37.0	78.	36.3	70.	35.7	48.
28.8	225.	30.9	186.	31.9	174.	33.2	225.	36.6	33.	34.0	166.	35.0	40.	35.2	41.	34.8	38.	33.9	90.	34.5	30.
24.8	20.	24.0	0.	26.3	27.	27.0	38.	33.6	196.	26.3	31.	26.8	270.	27.4	282.	26.6	242.	26.3	246.	25.3	243.
18.9	191.	19.7	192.	17.2	196.	19.3	212.	26.4	33.	23.9	233.	19.8	185.	18.4	175.	23.6	310.	23.8	312.	24.6	324.
19.8	31.	18.0	92.	17.0	103.	17.9	162.	20.7	228.	17.9	184.	23.0	243.	20.3	238.	20.8	239.	20.3	244.	21.2	234.
19.5	332.	20.0	341.	19.4	347.	19.4	321.	18.2	166.	19.1	307.	12.8	223.	14.0	227.	10.6	222.	11.8	216.	12.9	208.
6.2	180.	6.9	178.	5.9	176.	5.3	160.	15.1	246.	6.4	146.	7.3	173.	7.9	172.	8.4	197.	7.5	150.	6.7	146.
15.8	161.	17.1	154.	16.7	154.	17.6	148.	6.6	154.	18.2	150.	18.5	168.	17.7	164.	17.3	171.	16.1	139.	13.2	146.
21.5	288.	19.3	237.	19.4	250.	21.3	248.	18.6	145.	17.8	206.	13.4	132.	14.9	98.	13.9	114.	14.1	132.	14.3	134.
11.3	99.	14.3	75.	13.6	79.	17.8	201.	19.2	232.	17.1	91.	17.6	35.	17.1	29.	12.9	67.	11.1	76.	14.6	34.
22.1	97.	22.7	94.	22.0	98.	13.8	60.	17.0	38.	21.7	91.	20.9	89.	20.8	86.	19.6	99.	17.7	98.	18.7	66.
26.6	51.	27.0	56.	27.1	62.	22.7	88.	22.2	09.	26.5	54.	27.2	46.	26.4	65.	25.8	60.	24.3	56.	23.8	29.
33.2	36.	35.9	40.	35.1	48.	27.3	59.	27.1	60.	36.3	48.	35.7	42.	35.4	41.	34.8	31.	33.4	48.	34.2	342.
38.2	347.	39.1	353.	39.4	0.	34.1	44.	36.5	47.	39.6	1.	39.3	18.	38.9	17.	37.7	29.	37.1	24.	36.2	340.
38.0	334.	39.1	342.	39.6	350.	39.7	357.	39.7	0.	39.7	350.	39.4	9.	39.1	3.	38.2	13.	37.5	6.	33.4	339.
36.8	250.	38.2	299.	39.8	306.	39.8	348.	39.9	350.	39.2	299.	39.1	6.	38.5	3.	37.8	11.	34.8	4.	32.8	349.
35.1	72.	36.3	41.	36.7	50.	39.3	338.	39.2	306.	37.0	26.	36.7	13.	34.3	4.	39.0	16.	34.2	9.	31.7	328.
34.3	131.	35.3	109.	33.5	123.	37.3	22.	37.1	42.	35.4	136.	35.4	17.	35.2	312.	33.2	196.	32.8	298.	28.2	88.
30.2	146.	36.8	137.	31.1	170.	35.7	112.	35.6	114.	31.7	138.	31.4	166.	31.2	169.	29.9	106.	29.5	104.	21.7	319.
19.9	73.	23.4	236.	26.1	291.	31.5	140.	32.6	160.	19.8	138.	24.2	314.	23.0	302.	22.3	292.	22.9	303.	28.7	282.
31.0	278.	32.0	264.	32.3	292.	25.2	259.	20.0	204.	38.9	295.	31.3	278.	30.9	276.	28.9	290.	29.1	275.	34.0	264.
37.9	269.	38.6	275.	33.9	279.	32.2	292.	31.9	291.	38.9	283.	38.6	288.	38.1	287.	37.1	296.	36.6	286.	33.8	287.
36.4	17.	35.3	70.	36.5	90.	38.7	278.	38.9	280.	35.9	27.	36.6	275.	36.1	273.	34.7	288.	34.7	270.	35.9	202.
12.1	45.	19.4	26.	16.7	214.	34.5	121.	34.9	39.	16.0	167.	15.6	239.	13.1	188.	13.0	200.	12.1	197.	18.1	263.
8.2	64.	9.3	15.	17.7	278.	15.3	262.	16.6	212.	11.6	176.	14.8	229.	12.9	210.	12.7	230.	11.8	213.	14.1	226.
6.8	183.	0.1	76.	2.9	152.	11.4	202.	17.1	21.	17.7	339.	8.1	212.	7.3	196.	10.2	218.	9.5	200.	16.0	211.
10.4	166.	2.8	97.	11.7	176.	8.7	71.	5.0	149.	19.7	200.	13.7	212.	14.4	200.	14.0	220.	14.3	214.	13.9	208.
20.0	168.	19.6	177.	19.3	174.	10.9	186.	10.4	114.	18.3	130.	19.7	203.	19.1	204.	18.0	206.	18.4	204.	17.6	198.
22.2	159.	21.9	153.	21.7	156.	21.0	184.	20.2	188.	20.5	136.	20.0	194.	19.3	193.	18.1	194.	17.8	189.	17.3	173.
19.3	186.	21.8	334.	22.0	252.	21.5	156.	21.1	160.	17.9	209.	14.3	165.	14.7	171.	10.5	166.	12.2	164.	9.8	130.
13.2	251.	16.4	6.	16.7	6.	19.4	210.	18.3	193.	18.5	8.	6.3	69.	7.4	83.	3.6	83.	7.9	80.	8.4	38.
7.7	185.	18.6	299.	18.7	298.	18.1	325.	17.0	0.	19.0	296.	18.2	7.	17.6	18.	13.9	33.	17.7	337.	18.2	344.
18.0	305.	8.3	208.	9.0	222.	19.3	294.	19.8	304.	9.3	209.	17.7	306.	17.3	306.	18.0	328.	16.8	304.	16.8	276.
9.1	208.	7.0	113.	8.4	199.	9.6	271.	9.7	223.	8.5	120.	13.9	259.	13.2	267.	14.5	294.	13.9	257.	12.7	240.
6.3	154.	15.7	243.	5.3	145.	6.3	192.	5.3	180.	10.3	329.	9.3	220.	9.2	242.	9.6	218.	9.6	226.	9.3	219.
9.2	77.	4.4	100.	5.9	72.	2.1	127.	6.0	124.	8.2	123.	8.7	196.	3.4	222.	6.4	197.	6.9	199.	8.6	232.

Fig. 21 TABULATED MEASURED DATA (SLAVE ANT, HOR POL, E 20)

OBY NUMBER- 4 POLARIZATION- HORIZ ELEVATION- 20

-20.		-16.		-12.		-8.		-4.		0.		4.		8.		12.		16.		20.	
DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI
16.0	9.	13.6	13.	13.0	C.	11.3	2.	17.8	0.	9.0	6.	5.2	2.	6.3	5.	3.3	27.	3.4	16.	2.6	13.
6.3	152.	0.	124.	1.4	112.	3.5	29.	6.4	9.	2.8	13.	3.	37.	1.3	31.	8.2	62.	1.7	111.	2.3	66.
16.2	145.	8.6	18.	6.2	27.	9.4	0.	8.6	13.	5.7	1.	4.3	6.	4.1	17.	4.1	53.	5.2	30.	3.3	56.
10.0	133.	7.6	108.	3.6	197.	6.8	32.	4.3	129.	3.7	101.	2.9	2.	2.1	18.	1.4	24.	2.3	28.	0.9	36.
13.6	94.	7.7	38.	18.1	171.	6.5	36.	12.7	38.	5.6	70.	1.3	8.	0.9	7.	0.8	22.	0.4	28.	0.	22.
6.8	52.	5.8	52.	0.8	6.	5.2	23.	2.9	32.	4.8	17.	1.3	3.	1.3	4.	1.0	3.	0.8	4.	1.6	3.
9.9	116.	9.8	111.	9.3	56.	9.9	58.	3.9	19.	7.3	28.	2.6	9.	3.1	7.	2.3	3.	3.0	9.	3.1	11.
4.3	139.	6.1	133.	2.9	81.	0.8	142.	16.9	133.	2.6	179.	2.9	18.	2.9	13.	2.6	35.	6.4	121.	3.1	144.
5.0	80.	3.6	89.	9.3	150.	4.0	87.	9.6	165.	9.2	131.	3.2	45.	3.9	53.	2.1	2.	8.4	96.	5.8	72.
17.6	114.	11.0	33.	11.4	11.	9.3	2.	13.0	57.	5.7	2.	4.3	12.	2.3	13.	3.1	15.	2.6	23.	2.3	26.
7.6	21.	10.1	89.	12.6	88.	13.8	173.	13.9	135.	6.0	21.	3.6	6.	2.8	7.	2.7	14.	2.4	17.	1.8	26.
12.0	53.	7.7	24.	7.3	17.	5.0	4.	1.7	179.	13.2	180.	5.2	7.	3.3	12.	5.2	18.	4.3	17.	4.1	32.
6.7	17.	4.7	10.	4.4	7.	3.3	5.	9.1	67.	3.3	0.	2.3	6.	1.8	16.	1.8	22.	3.6	11.	3.6	15.
6.7	21.	6.4	18.	4.8	10.	3.7	1.	13.3	14.	2.5	12.	2.3	7.	1.3	14.	1.0	19.	1.9	21.	1.3	16.
6.9	16.	5.5	22.	4.0	10.	3.1	1.	9.7	9.	1.4	10.	0.9	7.	0.4	16.	0.1	19.	1.5	20.	1.5	14.
5.6	62.	4.4	43.	3.3	42.	2.3	150.	1.8	103.	1.2	49.	0.2	8.	0.2	16.	0.2	17.	0.4	37.	0.	14.
4.4	43.	1.8	27.	0.5	47.	0.3	42.	14.0	163.	1.4	9.	2.2	61.	1.1	33.	0.7	26.	0.4	41.	1.5	40.
6.7	78.	5.3	59.	1.0	22.	0.4	5.	3.2	177.	0.2	78.	4.8	33.	3.6	20.	1.6	9.	7.3	43.	7.5	33.
2.7	67.	1.7	14.	5.5	2.	3.4	0.	4.1	179.	3.2	9.	2.3	22.	2.7	13.	3.7	18.	0.1	29.	1.2	6.
7.4	70.	5.4	4.	5.9	5.	2.9	8.	7.2	30.	3.2	4.	1.4	9.	0.9	16.	1.4	22.	0.6	20.	1.7	7.
4.2	0.	7.8	19.	2.6	10.	2.2	6.	4.2	35.	1.4	14.	1.7	4.	1.4	8.	1.5	16.	1.4	14.	2.5	7.
4.0	150.	0.9	17.	0.3	126.	1.4	173.	1.3	38.	3.6	174.	3.1	3.	0.3	7.	0.7	23.	0.3	14.	0.4	11.
7.9	18.	0.8	10.	0.8	3.	0.5	8.	6.4	21.	1.1	10.	0.6	17.	1.6	24.	0.3	27.	1.1	18.	0.6	8.
3.6	8.	1.2	13.	0.9	4.	0.4	15.	7.6	32.	0.7	23.	1.3	21.	1.3	27.	1.2	31.	0.3	23.	0.7	[illegible]
1.1	5.	0.8	3.	0.5	7.	0.2	16.	3.3	48.	1.3	19.	1.6	19.	1.3	26.	1.3	30.	0.3	24.	0.	1.
3.5	170.	0.1	65.	1.2	123.	1.1	133.	4.7	59.	2.5	15.	1.4	24.	1.8	28.	1.3	30.	0.4	25.	0.8	8.
2.1	54.	1.4	55.	0.1	1.	1.1	15.	8.2	153.	2.1	60.	2.9	62.	3.6	79.	2.3	44.	1.8	25.	0.	25.
5.8	20.	5.5	31.	7.7	24.	6.2	13.	2.0	171.	2.6	43.	3.9	2.	8.2	85.	3.9	17.	1.1	161.	2.6	163.
0.6	36.	1.7	31.	2.9	17.	3.0	83.	3.3	64.	1.7	78.	3.2	11.	2.7	10.	2.1	13.	0.8	69.	0.6	13.
1.3	30.	2.1	89.	0.9	71.	1.7	25.	0.3	86.	2.3	9.	3.3	4.	2.1	10.	0.4	7.	0.9	84.	2.2	3.
2.7	96.	4.3	112.	1.6	89.	2.5	79.	5.4	162.	2.0	54.	4.2	15.	6.2	28.	0.6	32.	0.9	39.	3.9	35.
0.5	101.	2.6	124.	0.8	93.	0.4	79.	11.5	96.	0.2	93.	4.3	33.	3.5	53.	1.2	40.	1.3	38.	1.4	34.
7.4	174.	1.9	17.	5.9	127.	7.2	134.	3.6	69.	6.4	124.	1.8	8.	3.8	0.	0.7	41.	0.6	44.	2.8	46.
7.2	24.	4.7	109.	8.5	25.	8.6	3.	13.0	164.	7.7	3.	3.3	22.	1.5	106.	3.4	102.	6.2	161.	1.1	146.
4.4	171.	16.2	15.	3.5	112.	7.5	14.	6.7	147.	15.7	34.	9.4	139.	14.1	104.	12.7	39.	11.8	54.	12.0	92.
3.5	53.	3.4	55.	3.5	48.	0.7	93.	1.8	89.	3.3	50.	3.1	71.	3.0	63.	2.3	62.	1.0	54.	3.2	33.
3.0	42.	2.5	50.	2.1	59.	6.0	73.	6.1	73.	2.6	54.	2.9	53.	2.3	54.	1.6	49.	0.1	30.	2.8	19.
2.7	53.	3.5	57.	4.3	117.	3.4	111.	0.9	113.	7.3	11.	3.4	65.	3.3	63.	2.1	61.	1.9	57.	0.7	12.
0.6	67.	1.6	54.	2.0	64.	2.2	73.	2.1	72.	2.2	59.	2.1	60.	1.7	38.	1.0	57.	0.2	53.	3.9	24.
1.3	[illegible]	0.1	21.	0.9	26.	2.7	66.	1.9	72.	0.9	14.	0.9	34.	2.3	48.	0.9	47.	0.9	44.	5.4	37.
1.1	74.	0.2	39.	0.3	62.	3.2	113.	2.3	52.	1.6	54.	0.1	43.	0.7	30.	1.9	37.	1.8	33.	6.0	83.
0.1	[illegible]	0.7	95.	1.0	87.	2.4	14.	2.3	19.	1.7	24.	0.3	38.	0.2	30.	1.9	265.	2.2	44.	4.8	46.
0.	93.	0.5	87.	0.1	106.	4.8	54.	4.2	65.	1.1	22.	3.3	132.	0.2	90.	0.7	32.	1.1	119.	10.6	70.
6.0	16.	3.2	44.	1.2	59.	9.3	123.	6.9	124.	2.6	22.	3.7	102.	3.3	23.	3.1	7.	3.3	4.	3.6	26.
1.8	30.	1.9	62.	1.6	65.	5.1	39.	10.1	22.	1.9	83.	1.4	56.	0.4	46.	1.4	59.	0.9	45.	5.7	33.
1.3	36.	2.8	64.	2.3	67.	4.4	78.	4.9	77.	2.0	66.	1.8	33.	1.2	43.	0.2	53.	0.	46.	3.0	6.
1.8	97.	1.6	93.	1.3	148.	3.6	42.	3.9	33.	1.6	90.	3.1	52.	2.3	46.	1.0	54.	1.1	47.	2.2	24.
9.4	141.	2.8	162.	0.9	27.	21.4	87.	20.1	149.	0.	29.	1.1	49.	1.6	21.	1.7	15.	3.0	5.	3.2	83.
9.6	50.	8.7	11.	0.4	128.	0.5	128.	1.9	179.	2.6	99.	0.6	39.	1.4	20.	2.0	38.	2.6	23.	0.	36.
5.2	143.	12.6	36.	3.6	72.	8.1	94.	10.4	73.	13.9	138.	0.4	62.	3.1	23.	5.0	36.	4.4	32.	5.2	40.
1.1	4.	8.4	62.	0.5	10.	7.3	36.	9.3	32.	3.6	171.	2.0	46.	1.6	19.	0.6	33.	0.8	23.	1.3	24.
3.4	53.	4.0	53.	3.2	52.	4.2	64.	4.5	9.	3.9	46.	9.6	24.	1.2	38.	1.3	42.	2.0	36.	6.2	20.
9.3	6.	1.7	41.	21.7	156.	2.9	93.	4.6	88.	3.3	174.	5.7	56.	4.3	54.	3.0	54.	2.1	49.	2.1	32.
8.3	12.	5.7	107.	3.0	5.	1.3	122.	2.8	76.	2.2	63.	6.0	82.	3.3	131.	2.7	96.	4.2	96.	0.5	68.
5.2	1.	6.5	159.	1.4	109.	1.3	52.	1.9	48.	0.9	106.	14.3	139.	13.2	147.	16.4	147.	12.6	143.	11.1	122.
9.7	31.	1.5	61.	0.3	65.	0.1	90.	0.5	131.	0.1	59.	2.2	133.	2.3	93.	6.1	118.	2.3	85.	1.9	74.
14.3	163.	3.1	63.	4.2	49.	13.2	111.	11.7	99.	3.1	21.	2.5	30.	1.0	44.	1.9	66.	2.1	47.	1.8	18.
3.1	6.	11.4	117.	4.7	79.	4.1	65.	3.6	94.	0.	49.	2.4	19.	2.9	35.	3.0	15.	2.5	23.	2.0	3.
4.1	72.	15.5	158.	5.7	105.	4.5	113.	1.0	117.	14.4	108.	2.8	6.	2.3	13.	2.3	16.	1.5	6.	2.6	11.
9.1	152.	15.7	138.	9.6	144.	17.0	171.	10.4	171.	10.0	179.	7.9	92.	9.3	86.	12.5	117.	8.8	103.	9.4	113.

Fig. 22 TABULATED DIFFERENTIAL DATA (HOR POL, E 20)

OBY NUMBER- 4 POLARIZATION- VERT ELEVATION- -20

TRANS ANTENNA 60 RANGE VALUES

-20.		-16.		-12.		-8.		-4.		0.		4.		8.		12.		16.		20.	
SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE
26.5	13.	25.3	18.	25.1	16.	23.5	27.	26.0	25.	26.6	36.	25.2	35.	24.4	40.	24.3	32.	24.3	40.	28.3	356.
26.3	45.	23.9	48.	25.7	48.	25.3	36.	25.4	56.	25.7	48.	25.1	58.	24.7	67.	25.2	66.	24.8	62.	24.6	330.
22.4	340.	23.5	333.	22.5	338.	22.8	18.	21.1	330.	23.2	4.	21.5	351.	21.8	354.	21.9	358.	20.7	344.	18.1	330.
21.4	319.	22.1	314.	21.9	313.	21.6	330.	21.6	331.	21.4	331.	21.2	337.	20.8	337.	20.9	342.	21.1	332.	19.9	327.
20.0	311.	20.5	307.	19.8	306.	20.3	322.	19.6	327.	20.1	316.	20.3	334.	19.4	329.	19.8	339.	19.6	330.	21.0	324.
22.6	338.	23.3	332.	22.2	334.	23.0	344.	22.4	333.	22.1	352.	22.5	2.	22.1	5.	22.4	9.	21.2	2.	23.0	344.
22.7	0.	23.1	352.	22.8	359.	23.5	8.	23.2	16.	22.2	10.	23.1	19.	22.4	24.	22.7	28.	23.0	22.	24.8	2.
17.3	282.	15.0	243.	15.4	254.	11.0	218.	13.5	272.	14.3	226.	14.1	278.	15.8	286.	14.6	291.	14.4	289.	10.3	230.
19.0	162.	19.3	160.	20.0	154.	19.0	174.	16.4	188.	19.2	177.	17.6	191.	17.6	196.	17.5	194.	16.5	198.	18.4	184.
18.4	170.	19.4	182.	19.4	170.	18.0	232.	18.2	195.	20.1	230.	17.2	209.	16.5	213.	16.5	210.	16.5	214.	17.2	236.
11.9	174.	9.7	194.	14.1	165.	8.2	214.	10.9	195.	10.7	194.	10.5	207.	7.7	219.	11.4	206.	9.1	216.	11.5	214.
19.8	202.	16.3	205.	21.6	202.	18.1	222.	17.1	217.	17.5	218.	15.9	258.	15.5	230.	15.6	226.	16.4	232.	18.7	229.
30.0	222.	30.0	229.	30.7	217.	29.3	233.	29.3	229.	28.2	237.	28.3	220.	28.3	238.	28.1	247.	28.2	246.	28.0	243.
34.5	224.	31.5	[illegible]	33.3	221.	31.2	241.	33.5	246.	33.6	246.	31.7	250.	33.2	257.	33.0	261.	33.1	259.	32.5	244.
28.8	239.	0.	0.	27.7	234.	28.0	261.	27.7	268.	28.3	267.	0.	0.	28.3	274.	28.1	280.	28.2	274.	27.0	265.
16.9	262.	17.4	272.	16.4	254.	17.5	282.	18.6	298.	17.7	292.	17.1	304.	17.9	302.	18.2	300.	19.0	306.	25.8	285.
13.3	244.	14.3	250.	16.1	238.	14.4	266.	15.3	277.	14.7	282.	14.5	288.	14.5	293.	17.0	294.	14.2	298.	23.8	285.
17.1	219.	17.3	226.	16.9	211.	16.3	236.	13.9	247.	16.4	252.	15.5	254.	15.6	262.	16.3	264.	16.2	268.	0.	0.
18.0	204.	17.5	211.	17.3	203.	17.6	221.	16.4	226.	15.4	235.	[illegible]	240.	15.8	[illegible]	15.1	247.	14.9	267.	0.	0.
17.3	178.	16.0	188.	16.4	175.	15.9	200.	15.2	202.	14.9	238.	14.6	210.	14.1	212.	14.1	212.	14.5	214.	13.8	271.
18.0	110.	15.5	115.	19.1	100.	13.7	133.	15.5	132.	12.6	142.	13.2	162.	13.0	146.	13.7	146.	13.1	146.	15.9	256.
26.3	73.	26.1	82.	26.7	74.	23.1	104.	23.8	99.	25.2	104.	24.8	108.	24.7	111.	25.1	111.	24.4	114.	15.6	238.
31.2	76.	31.2	51.	31.6	78.	30.6	103.	30.9	94.	30.3	107.	30.8	104.	30.5	114.	30.4	112.	30.2	115.	13.7	206.
30.7	82.	26.4	93.	25.4	80.	30.1	110.	30.2	111.	27.7	113.	30.3	113.	30.4	124.	30.6	123.	30.3	125.	12.7	140.
26.8	78.	24.2	74.	26.8	82.	23.8	94.	26.0	93.	23.6	93.	25.4	132.	26.8	108.	26.7	108.	26.9	197.	24.9	104.
22.8	9.	23.7	348.	22.4	18.	23.3	348.	22.5	20.	23.3	17.	23.4	35.	23.9	38.	23.4	43.	24.1	44.	30.8	97.
20.3	280.	19.3	283.	20.3	290.	18.4	263.	19.2	298.	19.4	331.	19.1	305.	18.6	310.	18.9	309.	17.4	308.	30.8	116.
20.8	253.	18.9	256.	20.4	257.	19.3	237.	20.1	252.	20.1	289.	19.7	293.	19.6	280.	18.9	292.	19.8	290.	27.3	101.
17.3	245.	15.0	267.	15.8	240.	13.1	222.	19.7	286.	15.8	282.	15.0	285.	13.3	282.	13.4	292.	15.8	280.	24.2	55.
18.5	222.	19.0	220.	18.0	216.	18.0	212.	19.2	254.	17.7	253.	18.0	254.	17.1	260.	17.5	259.	17.8	258.	18.5	316.
20.4	[illegible]	21.7	237.	19.6	218.	21.0	230.	21.3	236.	18.8	255.	19.9	267.	20.5	264.	19.9	270.	19.1	270.	19.1	287.
5.1	[illegible]	13.4	164.	15.8	138.	13.4	137.	14.2	192.	12.6	194.	15.1	182.	13.1	192.	13.3	184.	13.4	201.	15.6	274.
25.3	135.	24.6	131.	24.5	126.	23.5	124.	23.2	143.	24.4	144.	23.8	146.	24.1	149.	23.9	150.	24.2	146.	17.6	253.
30.1	145.	30.6	140.	30.5	140.	30.2	144.	30.2	156.	30.9	150.	30.1	162.	30.0	164.	30.1	164.	30.5	154.	18.8	251.
32.9	142.	32.0	138.	32.1	132.	31.7	136.	32.3	146.	32.6	142.	31.9	148.	32.0	148.	32.1	148.	31.6	150.	17.9	165.
35.0	116.	36.3	127.	35.5	113.	33.3	120.	33.8	136.	34.8	127.	33.6	141.	34.8	142.	35.4	144.	35.5	144.	24.7	142.
37.3	67.	37.5	69.	37.6	62.	36.1	80.	35.2	90.	35.0	96.	35.0	94.	35.2	92.	36.1	103.	35.9	98.	30.1	155.
38.3	56.	38.4	37.	38.5	51.	38.4	61.	37.9	71.	37.5	67.	38.0	74.	37.8	77.	38.1	[illegible]	37.4	76.	31.9	148.
39.5	72.	38.1	78.	39.4	66.	39.3	70.	39.6	80.	39.3	78.	39.3	80.	39.2	82.	39.2	86.	39.0	82.	35.4	139.
34.9	115.	33.6	118.	34.7	112.	34.6	120.	33.8	136.	33.6	135.	33.9	137.	33.8	140.	33.5	143.	33.6	149.	36.3	130.
31.9	176.	31.5	178.	31.7	169.	31.8	182.	28.9	211.	29.9	215.	30.3	210.	30.8	214.	31.3	217.	31.2	217.	37.6	76.
27.9	246.	25.8	258.	25.8	239.	27.6	252.	27.1	268.	27.5	282.	27.9	286.	27.7	284.	28.3	288.	28.2	280.	36.8	92.
28.6	6.	28.4	5.	28.4	357.	29.2	9.	28.6	11.	29.2	20.	28.2	19.	29.0	25.	29.1	21.	28.6	18.	32.2	150.
36.4	16.	36.6	17.	35.9	[illegible]	33.7	11.	35.8	24.	36.4	34.	36.0	37.	35.1	38.	35.6	49.	35.9	44.	30.8	211.
38.5	35.	40.6	35.	37.1	30.	40.3	36.	39.3	43.	35.6	51.	37.8	61.	37.3	56.	39.7	63.	39.6	61.	28.7	284.
34.0	5.	35.3	16.	35.0	12.	35.2	16.	34.3	26.	34.6	26.	36.0	25.	31.4	3.	34.7	43.	34.7	37.	28.1	15.
26.4	294.	25.8	295.	25.2	294.	25.6	293.	24.5	305.	25.1	308.	25.3	319.	24.4	315.	25.2	321.	25.6	318.	34.9	37.
24.3	248.	25.2	255.	24.0	263.	23.3	262.	24.1	288.	24.2	290.	25.1	322.	22.5	292.	23.7	299.	24.4	302.	39.7	58.
19.1	188.	19.7	183.	19.7	178.	19.1	184.	18.4	211.	18.4	232.	18.2	268.	17.9	205.	16.7	208.	17.3	208.	35.5	42.
22.4	160.	23.5	162.	23.0	152.	21.4	156.	21.6	168.	21.6	176.	21.9	176.	20.1	182.	21.6	194.	21.7	185.	25.3	318.
22.9	196.	23.0	189.	23.0	182.	22.8	188.	23.1	200.	21.5	[illegible]	22.3	206.	21.0	206.	22.3	206.	21.3	206.	25.0	305.
22.1	239.	23.0	232.	23.7	225.	24.7	228.	23.4	246.	24.4	248.	24.2	249.	22.1	256.	24.7	256.	23.4	254.	16.8	234.
20.5	276.	23.8	268.	20.7	259.	21.3	262.	21.8	270.	22.2	288.	22.6	289.	20.0	300.	24.3	292.	23.1	288.	20.6	162.
20.1	312.	20.3	318.	21.0	316.	23.6	312.	21.0	324.	23.6	342.	21.3	356.	20.2	348.	20.9	357.	21.0	354.	21.4	230.
19.9	290.	20.4	294.	20.6	297.	20.3	284.	22.1	287.	23.0	313.	19.9	328.	19.7	327.	20.7	332.	20.8	330.	23.8	244.
18.6	266.	19.2	266.	20.0	262.	19.2	252.	19.2	253.	17.5	291.	19.8	296.	18.2	305.	19.8	292.	19.3	306.	23.6	284.
14.4	242.	14.4	244.	16.9	222.	15.5	224.	14.4	220.	14.1	278.	14.6	242.	14.9	295.	15.6	256.	14.8	276.	20.5	351.
13.5	240.	13.2	236.	16.5	206.	14.5	219.	15.0	223.	12.5	274.	14.9	228.	11.9	289.	14.8	247.	12.1	274.	20.0	334.
14.5	238.	13.6	238.	13.8	206.	13.6	226.	15.9	228.	10.9	283.	14.4	236.	11.9	298.	15.9	257.	11.9	286.	18.0	314.
15.6	252.	13.8	251.	14.4	222.	14.1	247.	13.5	253.	13.5	361.	14.4	250.	14.6	322.	15.9	254.	14.1	307.	15.4	296.

Fig. 23 TABULATED MEASURED DATA (TRANSMIT ANT, VERT POL, E-20)

SLAVE ANTENNA 60 RANGE VALUES

-20.		-16.		-12.		-8.		-4.		0.		4.		8.		12.		16.		20.	
SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE
21.3	290.	23.7	299.	23.1	300.	27.7	325.	27.8	325.	29.5	332.	29.3	337.	30.0	337.	31.0	338.	30.7	4.	31.0	2.
21.2	295.	25.3	306.	25.8	304.	28.3	338.	29.6	344.	30.9	0.	32.3	15.	32.4	14.	31.5	6.	32.0	25.	32.1	20.
21.2	295.	22.3	290.	23.2	302.	22.9	330.	24.0	337.	22.7	342.	24.3	347.	25.0	347.	24.8	341.	25.0	0.	25.6	337.
23.5	306.	23.8	299.	24.7	298.	24.2	325.	23.4	313.	24.3	323.	25.2	328.	22.5	332.	23.8	326.	24.3	342.	26.4	337.
22.9	335.	20.9	324.	23.0	306.	22.0	332.	20.6	306.	21.0	319.	19.5	301.	18.3	311.	16.8	301.	14.8	310.	16.7	306.
17.8	341.	13.4	330.	16.2	290.	20.0	330.	20.9	310.	22.9	319.	24.1	306.	24.1	308.	23.8	303.	23.2	310.	22.7	307.
11.0	288.	14.9	310.	16.9	280.	21.2	334.	23.8	323.	23.2	323.	23.9	322.	26.2	320.	26.5	320.	25.9	326.	26.0	320.
16.6	290.	15.6	316.	19.9	314.	23.1	338.	26.1	1.	21.0	7.	20.0	8.	25.7	8.	24.3	0.	25.6	17.	22.6	338.
23.1	331.	23.4	342.	26.3	344.	24.0	19.	26.9	22.	28.2	67.	28.7	53.	28.5	62.	25.9	92.	26.5	92.	26.7	89.
22.7	343.	24.9	0.	22.8	9.	30.6	94.	7.6	98.	19.1	46.	21.7	25.	28.2	32.	25.8	109.	25.9	110.	27.4	92.
23.8	347.	23.4	4.	16.9	336.	34.4	175.	28.0	6.	13.9	335.	15.2	320.	14.0	313.	19.0	308.	15.5	308.	15.7	306.
26.9	94.	26.3	87.	22.0	104.	33.4	176.	1.6	214.	4.2	196.	13.3	188.	13.9	184.	17.8	198.	19.4	190.	19.0	187.
27.7	110.	28.6	116.	29.3	119.	29.1	147.	28.4	134.	29.6	170.	33.3	184.	30.8	178.	31.1	204.	31.0	190.	32.1	188.
25.7	138.	31.5	134.	39.2	140.	33.7	172.	34.7	174.	32.6	206.	33.2	201.	33.7	194.	36.2	216.	36.3	214.	36.4	209.
19.9	160.	26.3	128.	25.2	180.	25.3	211.	26.2	220.	23.6	229.	27.8	230.	27.5	220.	29.4	232.	28.9	226.	29.2	224.
8.6	249.	20.8	314.	13.0	258.	13.9	300.	14.0	307.	13.6	308.	14.7	303.	13.6	300.	15.8	300.	11.5	284.	13.2	293.
8.9	338.	19.4	331.	15.2	306.	18.7	332.	19.3	334.	18.5	330.	13.1	316.	16.1	320.	13.5	297.	22.1	298.	13.0	331.
26.3	66.	24.1	350.	18.4	376.	14.4	2.	28.6	14.	13.1	333.	7.3	287.	6.2	270.	10.0	235.	11.6	237.	9.7	232.
20.8	356.	23.1	359.	21.8	15.	33.9	20.	4.7	2.	29.3	9.	3.9	276.	2.3	243.	13.5	205.	11.9	206.	13.2	204.
24.2	343.	21.2	30.	17.2	6.	34.5	26.	0.1	132.	0.1	84.	0.1	309.	0.2	194.	0.2	172.	1.1	172.	0.2	170.
28.3	342.	22.8	343.	25.7	348.	33.8	41.	0.3	78.	0.1	64.	3.7	91.	0.1	93.	0.2	99.	0.1	100.	0.2	94.
32.8	346.	29.9	352.	29.2	351.	33.8	44.	27.6	20.	33.1	30.	34.8	39.	30.4	29.	30.2	38.	30.5	43.	30.6	42.
32.9	3.	33.3	358.	33.7	0.	32.8	30.	34.2	24.	34.6	28.	33.8	21.	35.0	30.	34.9	35.	33.9	49.	34.9	42.
33.9	11.	33.5	12.	34.3	7.	29.6	20.	33.9	30.	35.1	34.	35.1	34.	33.9	22.	34.5	43.	34.1	43.	34.2	42.
33.0	40.	33.5	36.	33.0	26.	3.1	309.	32.2	32.	32.9	37.	31.3	33.	30.7	26.	29.2	30.	27.6	29.	26.7	24.
30.6	33.	30.3	40.	30.5	10.	18.7	324.	29.3	357.	27.5	13.	26.0	3.	23.5	348.	24.2	346.	22.2	335.	23.6	329.
13.1	242.	6.5	239.	8.4	232.	18.3	337.	13.1	312.	18.3	317.	21.7	310.	23.4	304.	24.8	309.	25.8	303.	24.5	307.
13.1	236.	9.3	263.	14.1	236.	10.6	307.	19.1	313.	19.3	314.	23.1	309.	18.7	304.	18.3	300.	21.6	302.	21.7	300.
13.9	278.	13.1	297.	13.9	256.	16.7	275.	18.5	331.	17.8	333.	18.1	332.	18.7	326.	17.2	316.	17.7	324.	19.5	322.
17.1	261.	16.8	272.	13.7	234.	18.3	318.	9.3	298.	3.3	282.	7.9	280.	0.1	256.	4.8	229.	5.1	270.	5.5	274.
17.8	233.	16.0	236.	19.6	223.	0.1	133.	16.5	237.	15.1	238.	15.8	226.	13.6	221.	17.6	214.	14.3	218.	13.4	224.
14.2	189.	13.2	208.	13.3	209.	31.2	109.	14.9	286.	14.3	306.	16.1	290.	14.4	285.	15.3	273.	14.3	278.	16.4	294.
24.1	112.	14.3	118.	8.4	114.	34.2	74.	0.1	131.	3.4	134.	2.2	129.	3.1	113.	0.9	120.	22.8	94.	28.3	54.
30.7	112.	30.7	130.	30.9	104.	38.6	62.	30.5	115.	32.9	92.	31.4	92.	30.3	110.	30.2	102.	30.9	97.	29.2	92.
32.7	60.	33.2	32.	33.8	50.	40.2	40.	34.3	78.	37.4	73.	34.2	73.	34.0	84.	33.7	82.	33.3	[illegible]	33.3	84.
38.6	48.	34.9	39.	38.8	37.	41.1	19.	39.0	74.	38.7	67.	39.1	61.	38.4	78.	38.1	79.	37.7	82.	37.4	78.
39.8	17.	39.9	19.	39.9	9.	39.8	22.	39.9	39.	39.2	37.	39.6	44.	39.2	49.	38.6	46.	38.0	44.	37.9	38.
40.2	8.	39.5	7.	39.8	359.	33.1	80.	40.3	20.	40.6	18.	41.3	20.	40.6	18.	40.4	16.	39.2	14.	39.5	12.
38.7	13.	37.1	22.	38.1	10.	29.5	162.	40.8	22.	40.3	29.	[illegible]	20.	41.4	21.	41.3	20.	41.2	17.	41.3	14.
32.3	76.	33.3	63.	34.6	62.	29.6	254.	35.2	74.	34.2	80.	37.0	75.	37.1	75.	35.8	66.	37.5	57.	37.5	45.
31.6	166.	33.4	163.	30.9	149.	32.7	324.	30.7	134.	31.0	142.	31.2	130.	31.4	135.	31.4	131.	32.1	122.	32.6	98.
32.8	236.	31.2	248.	31.3	230.	39.6	330.	29.3	233.	27.3	222.	28.0	200.	27.4	184.	25.0	194.	25.8	162.	30.4	72.
33.9	304.	33.7	303.	33.9	303.	43.1	1.	32.9	321.	34.2	337.	31.3	324.	29.9	325.	28.8	333.	27.2	323.	28.3	322.
38.6	315.	39.5	314.	39.3	315.	37.0	330.	39.6	343.	42.7	338.	43.3	355.	39.5	359.	39.1	359.	38.6	332.	38.1	340.
42.6	338.	43.0	337.	41.9	334.	29.3	301.	43.3	339.	42.1	2.	43.6	6.	43.5	10.	43.4	4.	43.2	7.	42.9	9.
37.8	313.	37.2	306.	36.9	301.	26.7	289.	38.5	342.	38.3	343.	38.8	330.	38.6	2.	30.9	1.	38.9	4.	39.8	358.
29.7	278.	29.3	272.	27.9	264.	0.1	176.	29.6	302.	29.3	300.	28.5	298.	27.7	302.	27.1	292.	23.8	238.	25.9	284.
26.7	280.	24.4	266.	26.0	267.	0.1	144.	27.3	298.	26.4	293.	27.2	292.	26.2	284.	0.	6.	24.0	262.	24.1	260.
0.1	160.	0.1	146.	0.1	136.	0.2	159.	0.1	220.	0.5	170.	1.2	214.	6.9	177.	3.1	163.	14.0	152.	7.1	172.
0.1	128.	1.3	134.	1.3	128.	22.1	198.	0.2	143.	0.5	146.	3.1	144.	0.1	149.	0.2	141.	12.2	136.	0.1	143.
20.9	137.	0.9	130.	7.6	146.	20.2	253.	0.9	169.	20.7	142.	0.1	167.	3.1	170.	1.4	154.	0.1	164.	0.2	162.
24.1	178.	21.9	194.	21.5	186.	21.8	332.	20.9	201.	23.6	217.	23.0	202.	20.8	203.	18.6	203.	18.7	202.	13.9	199.
22.1	230.	19.8	248.	20.7	238.	18.2	226.	21.2	272.	24.2	248.	22.2	260.	22.0	206.	19.5	256.	19.6	249.	20.1	252.
22.1	323.	24.6	322.	22.9	316.	16.3	324.	23.1	334.	22.6	314.	23.3	326.	22.4	320.	21.7	312.	21.4	302.	21.2	309.
21.9	327.	21.1	324.	20.6	314.	19.7	12.	20.8	328.	21.6	297.	23.8	313.	23.0	300.	21.4	295.	22.0	282.	22.1	296.
19.8	326.	18.0	337.	16.9	313.	18.9	357.	18.3	339.	17.3	290.	19.1	323.	20.8	295.	18.8	306.	20.6	274.	20.6	334.
20.6	359.	20.3	19.	22.2	332.	22.4	3.	21.0	351.	16.5	310.	23.8	16.	13.9	4.	22.9	355.	16.7	304.	20.7	1.
16.9	348.	20.6	5.	16.7	336.	17.4	340.	24.8	350.	17.0	308.	17.4	15.	26.1	31.	25.5	23.	17.1	328.	22.3	20.
20.2	349.	21.1	336.	23.3	337.	19.1	340.	24.4	336.	18.7	311.	17.5	339.	17.4	353.	14.2	5.	19.6	342.	17.9	11.
18.8	337.	16.9	333.	17.9	323.	25.5	27.	13.8	333.	17.8	303.	16.3	342.	19.4	326.	16.0	336.	18.2	313.	14.9	347.

Fig. 24 TABULATED MEASURED DATA (SLAVE ANT, VERT POL, E-20)

DAY NUMBER- 6 POLARIZATION- VERT ELEVATION- -20

-20.		-16.		-12.		-8.		-4.		0.		4.		8.		12.		16.		20.	
DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI
5.2	43.	1.4	79.	0.	75.	2.2	62.	1.8	60.	4.9	62.	3.8	38.	5.4	65.	5.7	54.	6.4	36.	2.7	6.
5.1	110.	0.6	102.	0.1	104.	2.9	78.	4.2	72.	5.2	48.	6.9	48.	7.7	53.	6.3	60.	7.2	57.	7.9	50.
1.2	45.	1.2	43.	0.7	36.	0.1	40.	2.9	13.	3.5	22.	3.3	6.	5.2	7.	2.9	17.	4.5	14.	7.5	27.
2.1	13.	1.7	15.	2.8	15.	2.6	5.	3.8	16.	2.9	5.	4.2	8.	1.7	3.	2.8	16.	3.2	10.	4.5	30.
2.9	24.	0.4	17.	3.2	0.	1.7	13.	1.0	21.	0.9	3.	3.8	33.	1.1	18.	5.0	58.	4.8	20.	4.3	18.
4.8	3.	9.9	2.	6.0	44.	3.0	14.	1.5	43.	0.8	33.	1.6	56.	2.0	57.	1.4	66.	1.0	52.	0.3	37.
11.7	72.	8.2	42.	5.9	79.	2.3	34.	0.6	53.	3.0	45.	2.8	57.	3.6	44.	3.8	68.	2.9	56.	1.2	42.
0.7	8.	3.6	73.	3.	60.	12.1	140.	12.6	89.	6.7	141.	5.9	90.	9.9	82.	9.9	69.	11.2	88.	12.3	128.
4.1	169.	4.1	178.	5.	170.	5.0	155.	10.5	144.	9.0	110.	11.1	138.	10.9	152.	8.4	102.	10.0	106.	8.5	99.
4.3	173.	5.5	178.	3.4	161.	12.6	168.	10.6	98.	1.0	154.	4.5	178.	11.7	178.	9.5	101.	9.4	104.	10.2	114.
11.9	173.	13.7	170.	2.8	171.	26.2	99.	17.1	171.	5.2	161.	4.7	113.	6.3	94.	7.6	102.	6.4	92.	4.2	92.
7.1	108.	8.0	118.	0.4	98.	15.3	40.	15.5	3.	13.3	22.	5.9	30.	1.6	46.	2.2	28.	5.0	42.	0.3	52.
2.3	104.	6.4	110.	1.4	98.	0.4	86.	0.9	75.	1.4	61.	2.0	46.	2.9	58.	3.0	43.	8.6	48.	4.1	59.
8.8	86.	0.	95.	0.1	81.	2.5	69.	1.2	72.	1.0	40.	3.5	49.	2.5	63.	3.2	45.	3.2	45.	3.9	33.
8.9	71.	26.3	128.	2.5	54.	2.5	53.	1.5	48.	2.7	38.	27.8	150.	0.8	54.	1.5	48.	0.7	48.	2.2	41.
8.3	13.	3.4	42.	3.4	4.	3.7	18.	4.6	9.	4.1	16.	2.4	1.	4.3	8.	2.4	8.	7.5	22.	12.7	8.
6.4	94.	5.1	81.	0.9	68.	4.5	86.	4.0	57.	5.8	48.	0.6	28.	1.6	27.	1.5	3.	2.1	0.	12.8	16.
9.2	153.	6.8	124.	1.5	115.	1.9	126.	12.7	127.	6.3	101.	8.2	35.	9.4	8.	6.3	29.	4.6	31.	9.7	128.
2.8	152.	7.6	148.	4.5	172.	16.5	159.	11.7	136.	13.9	136.	14.4	36.	13.5	1.	1.6	42.	5.0	41.	13.2	156.
6.9	167.	5.2	158.	0.8	167.	18.6	174.	15.1	70.	14.8	124.	14.5	99.	13.9	18.	15.9	40.	13.4	42.	15.6	101.
10.6	128.	7.3	133.	4.6	112.	20.1	92.	15.2	54.	12.5	58.	12.5	61.	12.9	53.	15.5	47.	13.0	44.	13.7	162.
6.5	89.	3.8	90.	2.5	83.	8.7	40.	3.8	79.	7.9	76.	13.0	69.	5.7	82.	5.1	73.	6.1	69.	15.3	164.
1.7	71.	2.3	33.	2.1	78.	2.2	73.	3.3	70.	4.3	79.	3.3	83.	4.5	84.	4.5	77.	4.7	63.	21.2	164.
3.2	71.	7.1	78.	5.9	73.	0.5	90.	3.7	81.	7.4	79.	4.8	71.	3.3	102.	3.4	80.	3.8	82.	21.5	106.
6.2	38.	9.5	38.	6.2	56.	20.7	145.	6.2	61.	7.3	56.	4.9	69.	3.9	82.	2.5	78.	0.7	78.	1.8	80.
7.8	44.	5.1	52.	8.1	8.	4.6	24.	6.8	23.	4.2	2.	2.6	32.	1.4	50.	0.8	57.	1.9	69.	7.2	128.
7.2	18.	12.8	24.	11.9	48.	0.1	74.	6.1	14.	1.1	18.	3.6	9.	4.8	4.	5.9	0.	8.4	5.	6.3	171.
7.7	7.	9.4	9.	6.3	21.	8.7	70.	1.0	33.	0.6	25.	3.4	14.	0.9	24.	0.6	6.	1.8	12.	9.6	161.
1.4	33.	0.1	50.	1.9	16.	1.6	33.	1.2	45.	2.0	51.	3.1	47.	3.4	44.	1.8	24.	1.9	44.	4.7	93.
1.4	39.	2.2	46.	4.3	18.	0.5	106.	9.7	44.	12.2	29.	10.1	6.	17.0	4.	12.7	50.	12.7	12.	13.2	42.
2.6	3.	5.7	1.	0.	5.	20.9	95.	4.8	21.	2.7	17.	4.1	41.	6.9	45.	2.3	54.	6.8	52.	3.7	63.
0.9	34.	0.2	44.	2.5	71.	17.8	48.	0.7	94.	1.7	122.	1.0	108.	1.3	95.	2.0	89.	1.1	77.	1.2	20.
1.2	23.	10.1	13.	16.1	12.	10.7	50.	23.1	12.	19.0	10.	21.6	17.	24.0	36.	25.0	30.	1.4	52.	10.7	161.
0.6	53.	0.3	40.	3.4	36.	8.4	82.	0.3	41.	2.0	58.	1.3	73.	0.3	54.	0.1	62.	0.5	57.	10.4	156.
0.2	82.	1.2	86.	1.7	87.	8.5	98.	2.0	68.	4.8	69.	4.3	75.	8.0	64.	1.6	66.	1.7	64.	15.3	81.
2.8	68.	2.6	88.	3.3	78.	5.3	101.	3.2	62.	3.9	60.	3.5	88.	3.6	64.	2.7	65.	2.2	62.	12.7	64.
2.	50.	2.6	30.	2.5	53.	3.7	38.	3.7	55.	3.2	49.	3.6	50.	4.3	43.	2.7	55.	2.1	54.	7.8	117.
1.9	48.	1.1	53.	1.3	52.	3.3	19.	2.6	51.	3.1	49.	3.3	34.	2.8	59.	2.5	62.	1.8	62.	7.6	134.
0.8	59.	1.0	56.	1.3	56.	10.0	92.	1.2	58.	1.2	55.	2.1	60.	2.2	61.	2.1	64.	2.2	63.	5.9	125.
2.4	39.	0.3	53.	0.1	50.	5.3	134.	1.4	62.	0.6	39.	3.1	62.	3.3	65.	2.3	77.	3.9	83.	1.2	55.
0.3	10.	1.1	15.	0.3	20.	1.1	142.	1.8	57.	1.1	74.	3.9	72.	0.4	70.	0.1	86.	0.9	95.	3.0	22.
4.9	10.	5.4	10.	4.5	9.	12.0	98.	2.4	35.	0.	60.	3.1	66.	0.3	100.	5.5	94.	2.4	118.	6.6	20.
5.3	62.	5.3	62.	5.5	54.	13.9	8.	4.3	50.	5.0	43.	3.1	55.	0.9	60.	0.3	48.	1.4	55.	5.9	172.
2.4	61.	2.7	63.	3.6	56.	1.3	41.	3.8	36.	6.3	36.	4.0	42.	4.4	39.	3.5	49.	2.7	52.	7.3	153.
4.1	57.	2.4	58.	2.5	56.	10.8	95.	4.2	44.	3.5	49.	3.8	55.	6.2	46.	5.7	54.	3.6	54.	14.2	76.

3.6	52.	1.9	70.	1.9	71.	8.5	87.	4.2	44.	3.9	43.	4.8	35.	7.4	3.	5.8	42.	4.2	35.	10.9	17.
3.3	16.	3.7	24.	1.7	30.	25.5	122.	5.1	3.	4.4	8.	3.2	21.	3.3	13.	1.5	29.	3.2	30.	9.0	111.
2.4	12.	1.2	11.	2.8	4.	22.9	118.	3.2	10.	2.2	0.	2.1	10.	3.7	6.	23.7	61.	0.4	40.	15.6	156
19.0	28.	19.6	37.	19.6	42.	18.9	25.	18.3	17.	17.9	32.	17.3	6.	11.0	28.	[illegible]	45.	3.3	44.	28.4	130.
22.5	32.	21.7	29.	21.7	24.	0.7	42.	21.4	23.	20.5	30.	21.8	52.	20.0	53.	21.4	43.	9.3	49.	25.2	175.
2.0	59.	22.2	39.	15.4	36.	2.6	65.	22.2	31.	0.8	64.	21.9	39.	20.9	30.	20.9	42.	21.2	42.	24.9	143.
2.0	61.	3.1	38.	2.2	39.	3.1	104.	2.7	45.	0.8	31.	4.2	47.	1.3	33.	[illegible]	55.	4.7	52.	0.9	6.
1.6	46.	4.2	20.	0.6	21.	3.1	64.	0.6	[illegible]	1.4	40.	3.4	29.	2.0	34.	4.8	36.	3.3	39.	0.5	70.
2.0	11.	4.6	3.	1.9	0.	4.6	14.	2.1	12.	2.0	26.	2.3	30.	2.2	28.	0.8	45.	0.4	52.	1.8	109.
2.0	37.	0.7	30.	0.	17.	1.2	89.	1.3	41.	1.6	16.	3.9	19.	5.3	27.	0.7	37.	1.2	48.	0.7	52.
0.2	60.	3.2	71.	3.1	51.	0.4	105.	0.7	86.	0.2	1.	3.7	20.	2.6	6.	1.0	14.	1.5	32.	3.0	20.
6.2	116.	5.9	135.	5.3	130.	6.9	137.	6.6	131.	2.4	32.	6.4	134.	1.0	69.	7.3	99.	1.9	18.	0.2	10.
3.4	108.	7.4	129.	7.2	130.	2.9	121.	9.8	130.	4.5	34.	2.5	147.	14.2	102.	10.7	136.	5.0	52.	2.3	46.
5.7	111.	7.5	118.	7.5	131.	5.5	114.	8.5	124.	7.8	31.	3.1	125.	3.5	52.	0.3	118.	7.7	56.	0.9	57.
3.2	95.	3.1	82.	3.5	101.	11.4	143.	0.3	77.	4.3	1.	2.1	92.	4.8	4.	0.1	82.	4.1	3.	0.5	53.

Fig. 25 TABULATED DIFFERENTIAL DATA (VERT POL, E-20)

DAY NUMBER- 4   POLARIZATION- VERT   ELEVATION-

TRANS ANTENNA 60 RANGE VALUES

-20.		-16.		-12.		-8.		-4.		0.		4.		8.		12.		16.		20.	
SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE
0.3	85.	26.6	5.	26.3	307.	23.7	8.	18.3	101.	17.7	62.	26.8	22.	24.6	324.	23.8	34.	24.2	31.	23.7	26.
6.8	100.	26.3	33.	26.5	27.	23.9	32.	25.8	36.	17.7	62.	26.1	30.	26.0	2.	26.3	64.	23.5	38.	24.5	35.
13.4	72.	23.1	319.	29.1	322.	23.3	317.	24.9	30.	24.9	90.	21.7	328.	16.7	297.	21.5	356.	21.8	341.	21.5	339.
22.8	321.	21.9	312.	22.1	312.	21.4	314.	22.2	323.	20.9	330.	21.5	322.	16.2	278.	21.2	326.	21.2	328.	21.3	319.
21.7	322.	21.2	306.	21.1	314.	20.7	312.	23.9	310.	20.3	320.	23.3	319.	18.4	284.	19.3	316.	20.1	324.	19.6	316.
25.2	342.	23.3	328.	24.0	337.	22.8	336.	21.9	329.	19.6	323.	22.7	353.	20.2	307.	22.5	333.	21.3	354.	21.6	348.
23.3	2.	25.9	333.	23.2	358.	22.6	334.	22.3	344.	22.1	350.	22.2	10.	21.5	331.	22.5	16.	22.3	17.	22.2	9.
7.8	253.	7.7	226.	6.0	226.	9.0	221.	17.3	294.	23.1	5.	12.4	233.	21.3	25.	14.7	294.	14.7	245.	13.3	267.
18.9	202.	15.8	172.	16.2	162.	16.7	176.	16.5	166.	13.8	228.	17.7	164.	22.8	78.	18.2	184.	19.2	182.	18.5	178.
17.9	222.	13.0	190.	16.1	195.	14.9	193.	17.0	194.	17.3	182.	18.7	204.	21.6	89.	17.8	201.	18.1	194.	18.6	192.
7.8	254.	4.1	214.	3.9	227.	3.3	211.	13.0	203.	15.9	201.	6.6	207.	22.1	348.	10.5	198.	11.5	189.	11.5	182.
20.0	242.	16.4	216.	17.4	212.	16.3	222.	16.3	216.	7.9	206.	19.6	223.	14.3	184.	17.2	224.	18.0	218.	17.1	223.
29.6	244.	30.3	230.	29.1	239.	28.5	232.	29.3	232.	17.3	220.	29.3	235.	31.2	170.	28.5	234.	28.5	236.	28.0	235.
33.6	233.	33.2	235.	33.3	238.	31.5	238.	33.3	240.	28.3	236.	31.9	241.	32.6	189.	32.4	241.	30.8	241.	33.0	245.
29.3	264.	27.6	248.	28.1	243.	26.8	256.	27.7	234.	32.3	241.	23.7	238.	29.9	208.	27.9	270.	27.0	260.	27.8	259.
16.8	288.	16.9	274.	17.9	279.	10.4	204.	16.7	278.	27.7	266.	17.6	293.	15.4	242.	18.4	293.	17.8	283.	16.8	276.
14.7	274.	13.6	262.	13.9	244.	12.9	248.	13.8	270.	16.9	286.	14.0	279.	11.3	238.	15.4	271.	14.7	268.	19.4	269.
17.6	230.	16.2	233.	16.0	238.	15.3	234.	13.3	243.	14.2	276.	15.1	244.	13.4	201.	16.0	249.	13.7	242.	16.1	248.
17.4	240.	13.8	226.	16.3	223.	15.2	218.	13.0	228.	14.4	290.	16.2	228.	12.6	176.	16.3	231.	18.0	[illegible]	16.3	233.
15.1	220.	13.9	232.	14.6	211.	13.8	204.	14.4	202.	15.1	226.	14.9	203.	16.0	144.	16.5	207.	15.8	194.	16.3	233.
10.4	146.	8.2	132.	7.3	143.	12.8	130.	12.7	133.	13.4	197.	13.6	133.	21.8	61.	14.4	143.	17.2	129.	18.3	134.
28.4	118.	25.0	92.	24.1	102.	24.3	93.	24.7	100.	14.6	136.	24.4	104.	27.9	41.	24.9	109.	23.7	102.	33.0	107.
30.3	122.	30.9	82.	32.6	88.	32.7	82.	30.4	98.	29.0	332.	33.1	132.	30.3	41.	30.3	102.	30.2	100.	30.6	139.
25.6	126.	30.3	96.	29.3	102.	29.9	98.	27.2	109.	10.9	90.	28.6	106.	20.5	49.	30.7	114.	19.6	108.	30.2	116.
21.8	111.	27.2	78.	26.7	92.	26.6	78.	26.0	84.	23.7	106.	25.5	93.	26.2	32.	26.0	100.	26.6	94.	26.5	101.
24.7	46.	23.1	346.	22.4	350.	22.8	4.	22.6	8.	24.2	75.	23.5	20.	21.8	348.	23.5	43.	24.0	32.	23.1	42.
21.9	306.	19.4	285.	19.0	292.	19.8	287.	18.6	248.	25.1	354.	19.4	297.	17.9	283.	19.0	300.	18.6	304.	19.0	307.
21.4	286.	20.9	270.	19.6	271.	19.6	274.	19.6	280.	18.6	298.	19.6	282.	17.0	247.	19.3	285.	19.8	280.	18.8	280.
17.9	272.	11.8	260.	13.1	266.	14.3	254.	13.6	261.	20.0	290.	15.2	267.	9.3	256.	19.8	275.	13.6	264.	15.7	268.
18.9	334.	17.6	232.	17.9	239.	18.0	231.	17.0	237.	14.6	280.	16.8	218.	9.4	210.	17.9	241.	18.4	246.	18.3	262.
19.2	253.	20.1	244.	15.9	246.	18.8	242.	19.8	244.	17.9	240.	18.8	251.	15.4	200.	20.1	240.	17.5	237.	19.2	240.
11.0	202.	10.8	178.	10.6	182.	14.2	164.	13.8	164.	20.2	246.	14.7	168.	19.0	111.	14.7	168.	16.2	138.	18.5	132.
22.4	142.	29.0	143.	29.3	141.	23.1	138.	25.6	139.	14.8	166.	24.3	144.	24.7	97.	26.6	144.	24.1	143.	24.3	145.
29.4	149.	29.4	146.	31.3	144.	29.9	144.	29.5	157.	26.4	147.	29.8	158.	29.8	118.	30.4	158.	31.0	152.	30.6	156.
31.3	140.	31.4	136.	31.6	144.	31.3	135.	31.9	142.	29.9	138.	31.2	142.	31.9	49.	31.9	150.	32.1	145.	31.7	131.
34.9	171.	33.0	111.	34.8	129.	35.0	126.	35.4	134.	31.8	145.	34.5	126.	35.4	68.	35.3	140.	34.8	127.	35.3	146.
37.1	47.	36.6	70.	36.0	84.	35.1	77.	35.6	86.	35.2	136.	35.3	79.	35.7	45.	36.1	94.	38.7	75.	35.9	91.
38.1	60.	37.7	53.	37.8	68.	37.8	66.	38.1	86.	33.6	83.	37.7	73.	36.8	17.	38.1	74.	37.5	[illegible]	38.3	71.
36.6	52.	38.2	74.	39.0	76.	37.9	76.	38.8	76.	37.9	69.	38.2	80.	38.9	23.	39.3	79.	37.7	87.	39.3	78.
31.9	120.	31.5	113.	32.8	129.	33.2	119.	34.0	124.	38.2	78.	32.4	136.	34.8	76.	33.6	136.	32.6	144.	34.2	124.
30.1	190.	29.9	182.	30.0	203.	30.2	194.	30.7	199.	32.9	134.	33.1	206.	29.6	144.	30.9	209.	30.0	204.	31.5	207.
26.1	236.	23.3	260.	23.6	274.	24.3	261.	27.0	269.	29.7	210.	26.9	276.	25.8	228.	26.6	290.	27.4	279.	27.8	266.
29.0	7.	29.4	2.	29.7	10.	28.0	13.	28.3	12.	25.8	259.	28.1	14.	28.1	329.	27.7	14.	30.7	23.	28.2	14.
35.8	18.	36.6	23.	33.9	27.	36.3	30.	35.4	27.	28.4	11.	35.6	30.	36.2	2.	35.4	38.	36.3	37.	35.6	32.
36.3	37.	37.7	30.	33.5	43.	39.4	42.	37.0	42.	33.6	30.	38.1	68.	39.6	12.	39.9	56.	37.1	52.	39.6	57.
35.1	21.	34.0	9.	34.8	24.	34.7	24.	32.2	4.	39.7	32.	33.6	22.	34.8	1.	34.8	38.	31.8	5.	34.6	38.
23.6	312.	25.1	307.	23.0	314.	24.7	309.	25.4	313.	34.2	31.	25.4	312.	24.0	284.	25.9	314.	24.3	308.	25.2	316.
23.9	275.	22.2	268.	23.9	280.	23.4	284.	23.2	282.	24.6	314.	22.1	282.	22.9	264.	24.0	290.	24.0	290.	24.6	294.
16.4	201.	16.9	196.	17.1	202.	17.3	197.	17.3	199.	23.6	285.	17.5	195.	16.7	163.	18.9	200.	18.7	199.	18.6	202.
20.4	172.	20.9	172.	22.2	181.	20.3	170.	21.2	175.	18.4	198.	23.4	174.	21.5	128.	20.8	172.	22.7	170.	22.0	175.
21.6	200.	21.3	207.	22.3	212.	22.3	204.	21.1	200.	25.3	187.	22.6	206.	21.2	154.	22.0	201.	22.2	207.	22.4	200.
24.4	239.	22.1	248.	23.1	244.	24.0	242.	22.0	247.	22.7	235.	21.8	249.	23.2	208.	24.2	246.	22.0	247.	24.2	244.
24.1	266.	20.3	273.	23.4	282.	21.1	278.	22.7	281.	23.4	243.	23.4	286.	20.8	247.	22.9	282.	19.4	292.	22.9	278.
21.3	319.	21.3	323.	21.3	330.	21.5	322.	20.3	333.	22.3	282.	23.7	333.	18.1	327.	20.4	339.	20.6	337.	19.5	334.
18.2	299.	18.4	294.	20.2	306.	19.3	288.	19.9	308.	23.0	330.	19.7	305.	14.6	320.	20.3	320.	20.6	313.	19.5	318.
13.8	275.	17.0	264.	17.2	282.	16.3	272.	11.1	282.	23.1	304.	16.3	282.	13.5	301.	19.0	284.	20.3	259.	19.2	287.
10.6	279.	11.3	244.	12.4	268.	13.4	254.	11.6	260.	16.0	278.	13.2	284.	14.2	328.	19.1	256.	16.3	282.	15.2	263.
12.3	267.	12.9	238.	11.7	259.	16.3	234.	11.7	232.	14.2	282.	12.8	237.	17.6	343.	19.2	265.	14.8	283.	12.9	247.
13.0	270.	14.2	236.	13.1	264.	14.7	231.	11.3	238.	13.5	246.	9.3	261.	14.8	337.	12.3	252.	15.7	227.	12.7	246.
14.2	274.	14.8	242.	15.2	260.	14.9	249.	12.1	278.	18.1	224.	9.9	290.	23.0	334.	10.3	255.	14.8	233.	13.0	259.

Fig. 26 TABULATED MEASURED DATA (TRANSMIT ANT, VERT POL, E-0)

SLAVE ANTENNA 60 RANGE VALUES

-20.		-16.		-12.		-8.		-4.		0.		4.		8.		12.		16.		20.	
SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE
19.0	302.	20.0	285.	25.0	307.	26.7	314.	26.9	324.	20.1	328.	28.2	326.	27.3	292.	26.7	301.	29.7	346.	33.0	6.
21.7	308.	22.4	299.	26.1	315.	28.2	322.	29.2	339.	28.3	356.	31.9	11.	30.4	315.	30.8	327.	31.6	20.	32.1	24.
20.9	294.	21.1	264.	21.8	290.	22.1	300.	21.8	322.	21.6	319.	23.0	336.	24.3	303.	25.1	310.	25.7	355.	26.5	3.
20.9	296.	22.3	266.	22.2	293.	22.6	300.	21.9	315.	21.4	333.	23.8	325.	20.7	279.	19.3	314.	21.0	330.	22.9	345.
19.7	314.	17.8	326.	20.1	322.	19.5	317.	18.9	325.	19.8	294.	18.5	316.	14.1	247.	12.5	312.	15.3	313.	15.5	315.
20.2	338.	12.9	345.	12.3	316.	14.6	326.	17.4	319.	22.3	288.	18.1	338.	17.4	261.	13.0	270.	12.0	306.	19.9	334.
20.4	27.	12.4	311.	14.0	297.	18.2	330.	21.2	325.	22.3	308.	22.0	325.	21.2	329.	21.1	294.	24.7	325.	23.4	325.
20.4	27.	11.3	305.	21.3	323.	20.2	14.	25.8	26.	22.9	339.	23.8	27.	23.6	358.	23.4	16.	25.3	34.	24.8	43.
12.5	324.	22.1	354.	27.2	12.	23.5	18.	24.9	31.	27.0	32.	27.6	56.	26.9	36.	25.6	40.	27.0	84.	27.0	80.
11.4	307.	21.0	13.	21.0	10.	24.3	24.	25.9	31.	23.8	24.	26.8	61.	26.5	40.	24.1	45.	28.2	75.	27.6	84.
15.6	332.	23.1	36.	22.7	8.	20.7	13.	17.3	14.	11.0	350.	14.2	354.	16.5	340.	19.3	40.	12.4	326.	15.0	2.
18.0	21.	23.2	110.	23.6	112.	0.5	150.	2.0	162.	1.9	167.	1.7	187.	23.7	116.	28.2	121.	17.9	183.	10.7	192.
18.0	21.	28.9	125.	29.8	131.	31.8	132.	32.1	139.	31.9	138.	31.7	149.	31.9	122.	35.8	134.	33.1	181.	31.9	181.
25.3	52.	32.1	142.	32.5	144.	31.5	148.	33.7	160.	30.2	161.	35.3	172.	36.1	134.	32.4	141.	35.0	200.	35.6	211.
27.3	124.	27.9	99.	25.1	136.	31.1	14.	23.2	184.	26.6	356.	29.6	166.	31.1	86.	27.1	66.	27.9	222.	27.7	223.
30.6	134.	18.8	317.	19.7	319.	17.9	339.	29.0	109.	18.0	335.	18.6	342.	13.0	358.	10.8	0.	11.7	282.	13.1	218.
27.0	122.	18.9	352.	19.1	348.	13.6	359.	13.7	3.	14.2	333.	15.2	358.	23.6	32.	25.5	56.	8.6	302.	7.2	232.
13.7	301.	23.5	28.	23.2	29.	21.5	6.	15.7	128.	26.7	20.	29.8	79.	26.3	60.	27.0	71.	2.5	229.	0.2	211.
16.9	336.	23.2	36.	24.8	30.	0.	123.	0.1	154.	5.8	100.	23.3	46.	24.9	53.	25.9	66.	0.2	195.	3.8	234.
17.0	7.	22.7	25.	23.0	18.	0.3	143.	0.6	163.	3.1	142.	24.5	45.	23.8	42.	24.0	36.	0.2	159.	0.6	180.
23.1	37.	20.0	353.	20.7	2.	12.1	75.	3.9	78.	0.4	75.	22.8	25.	23.6	6.	22.4	64.	13.4	79.	25.7	94.
22.8	42.	27.2	333.	28.2	1.	29.9	13.	30.3	21.	29.9	22.	31.6	25.	30.1	359.	30.6	56.	29.6	28.	29.2	34.
23.3	26.	33.0	6.	33.7	12.	34.5	17.	34.3	21.	33.2	20.	34.9	25.	35.7	2.	34.9	64.	34.3	30.	34.8	36.
18.1	3.	34.0	22.	34.4	21.	33.0	30.	33.3	25.	35.4	24.	34.5	21.	36.1	2.	30.6	56.	0.	0.	28.9	35.
27.7	6.	32.9	52.	33.4	46.	32.3	29.	33.2	33.	32.3	31.	33.9	24.	33.1	7.	29.7	44.	29.2	29.	26.9	20.
31.6	16.	29.8	67.	29.8	44.	28.3	22.	27.3	17.	28.4	20.	27.3	11.	27.3	328.	25.9	3.	23.8	338.	32.5	338.
32.1	26.	26.6	34.	11.4	244.	0.1	304.	3.6	312.	11.7	306.	13.3	313.	13.0	311.	20.1	313.	22.0	298.	21.2	298.
32.0	63.	14.9	296.	11.0	216.	10.1	340.	16.0	333.	14.4	319.	14.2	317.	0.1	346.	17.0	306.	16.0	292.	15.6	290.
29.5	82.	13.2	294.	10.3	249.	16.0	335.	14.6	335.	13.2	334.	14.6	342.	28.2	38.	12.1	326.	10.8	344.	10.9	346.
26.7	99.	13.0	260.	12.6	247.	8.4	332.	5.9	319.	2.3	326.	0.2	8.	27.1	56.	1.9	251.	1.6	18.	1.2	107.
17.2	330.	17.6	228.	15.7	222.	9.1	296.	11.1	268.	11.1	278.	15.5	318.	27.3	81.	14.2	231.	11.0	36.	3.9	214.
14.6	305.	23.8	148.	19.7	146.	15.2	23.	11.6	329.	17.8	5.	23.5	357.	9.1	10.	12.7	234.	18.0	350.	12.1	249.
13.8	283.	27.3	110.	27.1	104.	9.5	133.	2.3	133.	30.2	42.	30.9	75.	29.2	34.	51.7	101.	27.7	62.	27.9	60.
17.8	272.	32.4	108.	32.2	107.	34.0	78.	32.6	92.	33.0	96.	32.1	94.	33.4	60.	31.4	108.	31.1	80.	30.7	88.
17.0	155.	33.1	72.	33.4	74.	33.9	66.	34.0	73.	34.4	75.	33.9	75.	34.9	30.	33.9	94.	34.1	81.	33.7	86.
27.3	122.	38.9	58.	39.1	60.	38.3	58.	39.3	37.	39.9	64.	38.5	62.	39.2	25.	38.3	86.	37.8	70.	38.0	42.
31.9	122.	39.8	27.	39.8	24.	39.2	30.	39.5	26.	39.9	20.	39.4	22.	39.2	12.	38.9	38.	38.3	32.	37.0	26.
32.5	80.	40.1	10.	39.8	14.	41.3	16.	40.6	19.	41.5	17.	41.3	13.	41.8	337.	40.3	22.	40.5	10.	39.3	15.
38.2	70.	39.1	16.	39.6	21.	41.0	19.	37.8	38.	42.2	19.	41.8	18.	41.7	346.	41.0	24.	41.9	14.	41.4	14.
39.6	46.	33.8	78.	33.6	74.	36.1	74.	34.1	82.	37.0	74.	37.3	67.	37.6	20.	38.1	78.	38.2	56.	38.2	50.
39.6	20.	32.2	164.	31.0	156.	29.6	134.	31.6	144.	31.8	160.	32.8	132.	34.9	86.	33.6	138.	34.1	108.	34.2	98.
36.3	29.	30.6	244.	30.9	257.	29.9	221.	33.1	150.	33.2	172.	33.2	148.	29.5	66.	27.3	152.	28.6	141.	29.5	116.
32.7	87.	32.6	313.	32.4	311.	35.5	325.	33.1	333.	31.4	331.	33.1	322.	25.5	320.	28.8	337.	25.6	323.	23.5	321.
30.8	189.	38.4	323.	38.3	320.	39.6	342.	40.1	349.	39.4	347.	39.6	346.	38.7	304.	38.6	4.	38.7	350.	37.4	348.
31.2	263.	42.2	344.	41.8	341.	43.3	352.	42.6	330.	42.5	356.	43.5	357.	43.0	312.	41.7	13.	41.0	359.	42.7	5.
32.1	323.	37.3	320.	37.4	320.	38.0	334.	38.1	344.	38.1	343.	30.5	344.	38.5	316.	38.8	12.	38.7	357.	36.1	349.
33.7	350.	29.1	273.	29.0	275.	27.9	294.	28.1	299.	28.1	294.	27.1	287.	26.3	239.	26.2	290.	25.0	273.	23.7	268.
41.9	356.	25.0	270.	25.3	265.	23.1	276.	22.7	280.	25.3	292.	24.2	287.	21.0	234.	24.0	288.	21.9	239.	21.3	240.
37.3	340.	14.4	134.	0.1	143.	0.1	120.	0.1	137.	0.1	152.	0.1	184.	0.1	130.	0.1	182.	6.7	162.	9.1	135.
29.6	292.	25.7	97.	1.2	134.	0.1	153.	0.1	152.	0.1	138.	0.1	148.	0.3	112.	0.1	148.	8.9	142.	16.0	133.
23.3	277.	26.4	126.	4.4	148.	3.5	179.	1.9	177.	1.9	157.	0.1	160.	3.3	132.	0.2	166.	7.1	137.	26.8	97.
12.7	269.	24.4	176.	22.3	190.	23.3	200.	22.2	189.	21.4	195.	18.6	190.	0.1	182.	17.9	200.	19.3	196.	24.8	146.
25.9	111.	27.0	224.	19.0	247.	15.2	272.	19.2	232.	13.0	232.	21.9	242.	7.2	238.	18.9	255.	18.9	251.	16.6	141.
26.4	134.	20.9	328.	22.0	326.	19.6	338.	19.2	316.	18.7	331.	19.4	221.	15.3	327.	19.8	326.	19.4	314.	18.1	313.
25.0	188.	19.2	328.	18.0	320.	13.8	344.	16.5	269.	16.9	326.	16.6	318.	15.0	342.	21.0	301.	18.7	292.	19.8	293.
21.6	232.	13.1	327.	14.4	343.	14.3	40.	13.8	265.	14.1	344.	13.3	325.	3.6	66.	19.4	301.	13.6	313.	13.2	335.
22.2	329.	18.7	15.	21.2	37.	17.9	23.	23.0	151.	27.8	20.	16.6	38.	28.4	49.	17.8	11.	23.7	34.	13.0	52.
19.8	318.	21.6	7.	20.0	43.	22.2	353.	18.1	130.	19.3	28.	22.0	64.	20.9	32.	22.1	48.	21.7	32.	21.8	34.
12.2	326.	19.8	3.	17.3	338.	18.7	342.	17.9	339.	17.3	1.	21.7	32.	21.8	24.	19.2	56.	22.6	30.	20.3	87.
15.3	26.	13.1	353.	16.4	339.	13.7	330.	16.7	333.	15.1	355.	15.8	31.	17.1	12.	19.7	33.	17.0	14.	20.3	78.

Fig. 27 TABULATED MEASURED DATA (SLAVE ANT, VERT POL, E-0)

DAY NUMBER- 4 POLARIZATION- VERT ELEVATION- 9

-20.		-16.		-12.		-8.		-4.		0.		4.		8.		12.		16.		20.	
DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI
18.7	143.	6.6	79.	1.3	0.	1.3	94.	10.6	139.	10.4	74.	1.3	56.	2.4	32.	2.9	93.	5.5	45.	6.8	20.
12.9	160.	3.5	91.	7.4	71.	2.3	70.	3.4	57.	13.6	66.	5.2	19.	4.4	68.	6.5	99.	8.1	58.	7.6	91.
7.5	158.	1.0	53.	1.7	32.	1.0	17.	3.1	68.	3.5	91.	1.5	6.	7.6	8.	3.6	58.	3.9	14.	3.0	24.
1.3	27.	0.4	26.	0.1	19.	1.2	14.	0.3	7.	3.5	27.	3.7	5.	2.5	1.	1.0	12.	0.2	4.	1.6	26.
2.0	9.	5.4	20.	1.0	9.	1.2	5.	2.0	15.	3.7	26.	3.8	3.	4.3	37.	7.0	6.	4.8	11.	4.1	1.
5.0	16.	13.4	17.	11.5	21.	8.3	13.	4.5	10.	2.7	25.	3.6	41.	2.8	46.	9.5	85.	0.5	50.	1.7	44.
3.1	25.	11.5	42.	9.2	61.	4.4	24.	1.1	19.	3.7	42.	3.2	45.	0.9	92.	1.4	80.	2.4	92.	1.2	44.
12.6	169.	3.6	73.	5.5	97.	11.2	155.	0.5	102.	3.2	5.	11.4	154.	7.5	27.	8.7	122.	10.6	149.	9.5	156.
6.4	122.	6.3	178.	11.0	170.	6.4	155.	8.4	155.	13.0	170.	9.9	120.	4.6	44.	7.4	144.	8.8	98.	8.5	98.
6.5	95.	6.0	177.	4.9	175.	9.4	160.	8.9	163.	0.3	158.	13.1	149.	5.3	69.	8.5	156.	10.1	121.	9.0	138.
7.8	98.	19.0	178.	18.5	141.	15.4	164.	4.3	173.	4.9	149.	5.6	147.	5.8	8.	8.8	158.	0.9	137.	3.2	180.
2.0	139.	6.4	106.	4.2	150.	15.7	72.	14.5	54.	6.0	44.	17.9	33.	9.4	68.	11.0	105.	1.9	33.	6.4	28.
11.6	137.	1.6	102.	0.7	49.	3.3	100.	9.8	93.	14.6	82.	2.4	86.	0.	48.	5.3	100.	4.6	99.	3.9	54.
10.1	157.	1.1	93.	0.7	88.	6.3	93.	9.4	83.	2.5	79.	3.4	69.	3.7	55.	0.	100.	6.2	41.	2.6	34.
1.0	145.	0.3	149.	2.0	109.	4.3	118.	4.5	73.	5.7	89.	3.5	92.	5.2	122.	9.8	156.	8.9	38.	0.1	39.
13.8	154.	7.9	45.	2.8	40.	0.9	59.	12.5	169.	9.7	67.	1.3	52.	2.4	111.	7.6	67.	6.1	1.	3.7	38.
12.3	152.	3.3	93.	4.2	64.	2.7	91.	3.1	93.	3.7	67.	3.4	88.	12.1	154.	10.1	145.	6.1	94.	8.2	37.
1.9	51.	7.5	155.	7.2	142.	6.2	152.	0.4	113.	12.5	134.	14.7	165.	15.9	141.	21.0	173.	15.2	13.	13.9	37.
0.6	96.	7.4	170.	5.5	165.	15.2	95.	14.9	74.	8.4	142.	7.1	174.	12.3	123.	9.6	167.	15.8	29.	16.4	28.
1.9	167.	4.9	177.	10.4	167.	15.5	61.	13.6	59.	15.0	94.	9.6	155.	9.4	102.	7.5	151.	15.6	35.	13.7	43.
12.7	109.	11.8	142.	13.4	141.	3.7	55.	6.8	55.	13.0	122.	9.2	108.	2.1	55.	8.0	99.	3.8	90.	9.4	80.
5.6	75.	2.2	99.	4.1	101.	3.3	82.	5.6	79.	15.3	130.	7.2	79.	2.4	62.	6.6	53.	5.4	74.	4.2	73.
7.0	46.	2.5	76.	3.1	76.	4.3	65.	5.9	77.	6.2	82.	4.8	77.	3.4	39.	4.6	56.	4.3	70.	3.5	69.
7.5	123.	3.7	72.	5.1	81.	3.1	68.	6.1	83.	6.5	74.	3.9	83.	5.6	47.	0.1	58.	29.6	108.	1.3	81.
5.9	105.	5.7	26.	5.7	56.	6.2	49.	6.5	69.	7.1	79.	5.4	68.	6.9	25.	3.7	96.	2.6	67.	0.4	81.
6.9	30.	6.7	81.	7.4	58.	7.5	18.	4.9	9.	4.2	55.	3.6	9.	5.3	38.	2.4	38.	0.2	54.	0.6	64.
10.2	80.	7.2	109.	8.4	65.	17.7	17.	13.0	14.	13.4	46.	3.9	13.	2.9	48.	0.7	5.	3.4	6.	2.2	9.
10.6	159.	6.0	26.	9.6	59.	9.5	56.	3.6	50.	6.2	21.	5.6	79.	16.9	99.	2.5	21.	3.5	12.	3.2	19.
11.0	172.	1.4	54.	2.8	17.	1.2	61.	1.0	76.	4.8	94.	3.6	[illegible]	18.9	142.	3.7	53.	5.0	78.	4.8	76.
7.0	156.	4.6	28.	5.3	8.	9.6	91.	11.1	82.	12.3	97.	15.6	130.	17.7	154.	16.6	10.	17.0	132.	17.1	135.
2.0	77.	2.5	16.	5.2	24.	9.7	56.	8.7	24.	6.8	38.	3.6	67.	11.9	119.	5.9	9.	3.5	164.	15.3	26.
3.4	106.	33.3	33.	7.9	36.	2.3	144.	2.2	144.	2.4	119.	9.8	171.	9.9	101.	2.0	44.	1.8	160.	3.4	87.
6.6	141.	1.7	53.	1.8	37.	13.6	5.	21.3	6.	13.4	56.	3.9	69.	4.5	63.	7.1	65.	3.6	81.	3.0	69.
11.6	175.	3.0	58.	3.9	44.	4.2	35.	3.1	65.	6.6	51.	2.3	44.	3.9	50.	1.0	90.	0.1	64.	0.1	66.
14.5	45.	1.7	64.	1.0	79.	2.4	71.	2.1	72.	4.5	83.	2.7	67.	3.0	53.	2.0	56.	2.0	64.	2.3	65.
7.6	1.	3.9	53.	4.3	29.	3.3	68.	3.9	77.	7.1	81.	4.3	64.	5.8	35.	3.0	54.	3.0	57.	2.5	58.
4.2	55.	3.2	43.	3.8	60.	4.7	47.	5.9	60.	4.7	116.	4.1	57.	4.1	33.	2.8	36.	0.4	43.	1.1	65.
5.6	20.	2.4	65.	2.0	94.	3.5	53.	2.5	47.	5.9	68.	3.6	60.	2.9	60.	2.2	52.	3.2	69.	1.0	54.
1.6	12.	3.9	58.	0.6	55.	3.5	57.	1.6	36.	4.3	50.	3.6	62.	3.2	37.	2.5	35.	4.2	73.	2.1	42.
7.7	74.	2.3	35.	0.3	55.	2.9	45.	0.1	42.	1.2	6.	4.6	49.	3.4	56.	4.5	53.	5.6	88.	6.8	84.
9.5	170.	1.5	14.	1.0	49.	0.6	40.	0.9	55.	1.1	6.	2.7	74.	5.3	60.	2.7	71.	6.1	98.	2.7	180.
10.2	133.	5.5	16.	5.3	37.	3.4	40.	0.1	119.	0.9	38.	3.1	128.	5.7	162.	0.7	108.	1.2	150.	1.3	150.
5.7	52.	3.2	49.	2.7	59.	5.8	42.	4.8	39.	5.6	42.	2.3	52.	2.6	29.	1.1	17.	5.1	60.	4.7	55.
5.0	170.	1.0	63.	2.6	67.	5.5	48.	4.7	18.	11.0	26.	6.3	40.	2.3	38.	3.2	34.	2.4	47.	1.0	64.
5.3	132.	4.5	44.	2.3	64.	3.5	33.	5.6	46.	6.9	34.	9.4	51.	3.1	60.	2.2	43.	4.7	53.	3.1	32.
5.0	56.	3.3	49.	2.6	64.	3.3	50.	3.9	20.	1.6	69.	4.9	56.	3.7	67.	4.9	26.	6.9	8.	1.9	33.
13.1	38.	4.3	36.	4.0	39.	5.2	15.	2.7	26.	6.1	97.	1.7	25.	0.3	45.	0.3	26.	0.7	35.	1.5	50.
19.0	91.	2.8	2.	2.0	12.	3.3	22.	0.9	2.	2.7	22.	2.1	5.	3.9	30.	0.	2.	2.1	31.	3.3	54.
21.1	139.	2.9	62.	17.0	54.	17.2	77.	17.2	42.	23.5	123.	17.4	11.	16.6	30.	18.4	18.	12.0	37.	5.5	47.
8.2	129.	5.8	75.	19.0	67.	19.7	17.	21.1	23.	18.5	60.	23.3	16.	21.2	16.	20.7	24.	15.8	26.	6.0	42.
1.7	77.	4.9	43.	14.1	54.	18.7	25.	19.7	23.	21.4	30.	22.5	46.	17.9	22.	21.0	35.	15.1	50.	4.4	133.
11.7	90.	2.3	72.	7.6	54.	1.5	42.	0.2	39.	1.3	10.	3.2	39.	23.1	26.	6.3	44.	6.7	31.	0.6	98.
0.9	157.	1.7	91.	4.4	40.	5.9	6.	3.0	49.	4.4	9.	1.5	44.	13.6	9.	4.0	37.	0.5	39.	6.0	63.
5.1	165.	0.4	4.	0.7	4.	1.9	16.	1.1	17.	3.6	49.	3.9	9.	2.8	0.	0.6	13.	1.0	23.	1.4	19.
6.9	111.	0.8	24.	2.2	14.	5.5	55.	5.4	19.	3.1	4.	3.1	11.	0.6	22.	0.7	19.	1.9	21.	0.1	38.
5.8	65.	1.3	63.	2.8	63.	2.0	124.	4.5	21.	6.0	40.	4.7	43.	12.9	129.	0.6	17.	6.7	56.	6.0	18.
13.6	59.	7.7	131.	4.5	125.	4.5	126.	6.4	69.	11.8	102.	3.4	134.	16.2	81.	2.7	115.	7.2	172.	2.2	140.
7.5	51.	8.7	129.	0.4	126.	6.2	119.	6.4	122.	3.2	126.	11.2	167.	3.3	67.	0.9	163.	6.9	169.	3.9	165.
3.8	96.	5.7	127.	5.4	94.	4.0	111.	6.5	149.	2.0	115.	12.4	131.	2.0	67.	6.9	164.	6.9	163.	7.6	198.
6.9	112.	1.7	111.	1.2	59.	3.0	101.	4.5	175.	2.0	121.	5.9	131.	2.9	60.	9.4	138.	2.2	141.	7.6	178.

Fig. 28 TABULATED DIFFERENTIAL DATA (VERT POL, E-0)

I N P U T D A T A

DAY NUMBER- 4 POLARIZATION- VERT ELEVATION- 20

TRANS ANTENNA 60 RANGE VALUES

-20.		-16.		-12.		-8.		-4.		0.		4.		8.		12.		16.		20.	
SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE
1.8	88.	27.3	20.	2.4	96.	26.4	22.	14.6	313.	25.2	36.	3.1	102.	27.1	28.	26.6	18.	27.3	22.	33.9	83.
9.5	108.	26.5	38.	0.3	122.	26.3	49.	25.9	45.	25.8	56.	3.1	132.	26.7	34.	25.8	34.	26.9	42.	19.7	35.
15.1	63.	18.2	327.	0.5	103.	19.2	335.	18.9	341.	23.1	137.	3.2	117.	16.9	353.	20.9	352.	17.3	344.	19.4	349.
21.5	330.	23.1	324.	25.5	5.	22.3	343.	22.0	336.	22.4	332.	24.0	352.	21.1	342.	21.0	337.	21.4	338.	18.2	337.
20.0	329.	21.3	3.	20.0	340.	21.2	339.	21.2	335.	21.2	334.	20.7	344.	21.1	349.	19.2	332.	20.5	338.	19.8	12.
23.8	352.	24.2	343.	23.4	0.	24.1	3.	23.2	359.	23.2	356.	24.6	10.	25.1	6.	23.4	6.	24.2	1.	20.2	35.
23.4	7.	24.3	1.	23.5	19.	22.6	11.	23.5	18.	23.7	15.	23.1	25.	23.0	26.	22.6	22.	24.5	22.	19.7	40.
7.5	230.	7.5	230.	8.2	242.	7.1	233.	7.4	249.	5.8	247.	5.8	271.	4.3	267.	8.6	272.	5.2	283.	20.5	163.
15.4	195.	16.5	194.	16.9	200.	17.4	208.	15.9	199.	16.9	232.	14.9	219.	14.9	216.	14.3	209.	14.3	213.	19.7	174.
15.0	216.	16.7	216.	14.7	218.	16.2	223.	16.5	216.	15.4	220.	15.4	235.	15.8	236.	15.9	211.	11.6	227.	17.4	148.
6.5	235.	6.6	240.	6.9	244.	5.1	247.	5.5	247.	1.4	248.	2.4	274.	3.8	277.	8.0	228.	5.4	254.	23.8	328.
19.1	238.	19.3	236.	17.6	243.	17.4	249.	16.5	240.	23.1	253.	23.4	274.	15.2	261.	19.2	262.	18.3	245.	32.3	243.
31.3	249.	29.2	247.	24.5	250.	29.9	271.	29.0	254.	29.7	262.	33.7	282.	30.5	276.	29.1	252.	27.9	231.	27.0	237.
31.7	250.	33.4	260.	32.8	269.	33.7	277.	33.4	256.	33.1	274.	33.1	286.	32.0	282.	27.3	252.	29.8	272.	22.4	237.
27.5	271.	27.4	274.	27.4	285.	28.3	285.	27.5	270.	27.9	254.	27.5	296.	27.7	294.	27.5	279.	28.1	286.	22.2	212.
17.1	295.	17.3	330.	18.4	310.	17.4	313.	19.3	309.	15.3	310.	19.3	322.	18.4	321.	18.1	312.	20.3	317.	20.3	194.
15.2	280.	14.6	288.	16.7	293.	15.4	291.	15.5	297.	15.6	237.	15.6	312.	16.3	313.	14.3	304.	16.2	308.	18.4	214.
16.7	253.	15.7	259.	16.9	256.	17.2	273.	16.0	271.	16.4	272.	15.9	287.	15.9	280.	16.5	280.	16.5	281.	19.7	204.
14.8	241.	15.7	242.	15.9	246.	16.4	255.	15.8	258.	15.7	258.	16.1	276.	15.9	272.	15.5	261.	10.7	269.	15.6	182.
11.4	215.	15.1	220.	13.5	222.	15.2	233.	13.5	226.	14.4	229.	11.3	244.	14.3	247.	18.0	233.	17.5	232.	19.9	124.
12.1	141.	8.5	154.	10.1	159.	10.7	166.	7.1	162.	7.9	166.	5.5	171.	5.0	178.	6.8	167.	5.5	168.	25.2	115.
25.5	174.	24.3	114.	23.0	119.	24.3	123.	23.5	121.	22.0	124.	26.3	132.	20.4	136.	20.9	128.	22.6	121.	31.1	116.
29.4	113.	29.1	118.	29.8	120.	30.5	128.	29.7	115.	29.7	122.	26.1	130.	28.8	126.	29.6	120.	29.0	117.	30.4	123.
26.0	118.	29.8	124.	27.6	125.	29.7	133.	29.3	123.	26.8	121.	28.4	128.	27.2	124.	20.4	125.	27.3	116.	26.3	112.
24.5	97.	26.4	106.	26.6	104.	25.3	112.	25.9	93.	25.3	107.	24.7	104.	24.6	96.	27.5	97.	26.9	97.	21.3	54.
24.6	358.	23.5	7.	22.8	12.	24.1	14.	23.5	8.	24.0	14.	25.1	6.	25.7	0.	22.8	18.	22.8	19.	19.8	322.
20.2	304.	19.4	304.	19.0	312.	19.5	316.	18.9	315.	19.7	316.	27.3	301.	21.5	322.	19.6	317.	20.0	320.	20.7	268.
18.8	296.	20.4	291.	20.8	298.	21.2	299.	20.8	303.	21.1	303.	21.3	294.	18.9	308.	21.3	305.	20.2	306.	22.4	224.
17.8	294.	15.4	285.	15.8	292.	15.2	292.	16.2	292.	15.5	298.	21.9	298.	17.2	310.	15.8	302.	15.0	304.	22.1	213.
19.7	260.	17.6	250.	17.3	262.	19.4	274.	19.5	269.	17.7	272.	17.4	283.	17.7	285.	18.0	272.	17.6	279.	20.3	226.
20.9	243.	20.3	270.	20.1	270.	23.5	279.	21.1	275.	23.4	272.	17.6	282.	21.8	289.	20.1	279.	20.0	201.	22.3	149.
13.2	193.	11.8	216.	12.1	204.	15.5	214.	11.3	218.	13.1	210.	17.3	204.	11.3	241.	9.0	230.	10.0	224.	26.8	154.
22.0	162.	22.1	160.	21.6	164.	23.6	175.	21.4	166.	22.7	172.	30.3	194.	20.9	179.	20.2	157.	20.5	164.	30.6	160.
29.5	172.	29.2	153.	29.6	172.	28.9	181.	29.6	182.	29.1	178.	30.7	173.	28.9	196.	29.2	166.	28.8	174.	33.2	148.
32.0	144.	32.4	146.	32.5	146.	32.5	151.	32.2	146.	32.2	150.	35.5	138.	31.2	154.	31.9	143.	32.1	146.	35.3	136.
35.8	140.	35.8	142.	35.0	134.	35.7	144.	35.4	144.	35.6	142.	34.5	137.	34.8	132.	34.4	133.	34.8	138.	34.4	93.
35.8	92.	34.5	103.	35.0	92.	35.8	106.	36.2	100.	35.0	135.	35.4	115.	35.8	98.	35.8	87.	35.9	97.	39.0	84.
37.8	72.	39.3	72.	37.7	[illegible]	37.9	77.	38.0	[illegible]	38.0	78.	37.7	76.	37.7	80.	38.2	74.	37.3	74.	37.8	90.
34.9	76.	34.5	50.	37.9	51.	39.2	82.	39.7	80.	38.4	52.	35.1	92.	37.9	86.	39.0	79.	39.5	78.	33.4	142.
31.9	147.	33.3	136.	33.4	135.	33.4	139.	32.9	134.	32.0	138.	32.9	141.	31.6	140.	28.3	293.	31.8	140.	30.6	235.
29.3	270.	29.5	212.	29.3	210.	29.7	215.	29.7	213.	29.5	212.	29.9	213.	28.0	226.	30.0	14.	29.3	231.	29.1	292.
26.1	331.	26.5	249.	25.8	282.	27.2	288.	24.3	234.	27.8	286.	28.2	293.	27.5	298.	35.8	43.	25.6	308.	27.2	26.
28.6	20.	29.1	20.	25.9	22.	29.1	33.	24.9	42.	25.2	23.	27.5	23.	30.6	28.	39.7	56.	29.5	21.	40.2	98.
35.7	41.	36.2	48.	36.4	46.	35.3	55.	35.8	47.	35.1	50.	35.5	60.	35.6	56.	34.5	30.	35.6	39.	39.8	67.
39.2	60.	43.3	63.	40.0	65.	39.3	71.	40.0	64.	39.0	44.	38.6	64.	38.5	68.	25.1	337.	39.8	59.	35.1	57.
35.0	52.	34.8	30.	34.8	35.	34.9	49.	34.7	35.	34.8	36.	33.7	25.	31.6	6.	34.3	26.	34.7	30.	25.4	329.
25.3	316.	25.9	322.	24.7	321.	25.2	331.	24.9	320.	25.2	326.	25.2	323.	25.3	324.	24.5	321.	25.4	320.	24.1	286.
27.7	299.	23.5	295.	24.6	300.	24.2	303.	23.5	290.	23.6	330.	24.4	309.	23.2	298.	24.9	304.	23.9	296.	22.2	190.
15.5	212.	17.8	213.	19.3	209.	19.2	212.	16.9	216.	18.3	219.	17.9	226.	16.9	223.	16.1	213.	16.3	214.	22.4	168.
20.1	200.	21.3	194.	20.2	194.	21.7	206.	15.6	193.	23.5	176.	21.5	202.	19.2	195.	19.1	190.	19.2	168.	24.8	192.
21.7	217.	21.5	211.	20.4	214.	21.8	222.	20.1	216.	21.5	220.	21.5	227.	20.1	218.	19.4	209.	19.6	210.	24.8	240.
23.6	262.	24.7	258.	22.7	260.	25.6	270.	23.7	257.	22.0	258.	22.9	276.	23.3	272.	23.1	267.	22.1	265.	23.4	252.
23.7	294.	22.8	293.	20.6	299.	23.3	304.	22.2	292.	21.1	297.	19.2	311.	22.5	309.	24.0	302.	22.4	301.	20.9	200.
22.7	338.	22.2	340.	22.4	351.	23.3	350.	22.6	345.	22.6	344.	23.9	336.	22.7	356.	22.1	352.	22.6	349.	18.5	176.
22.1	317.	20.8	312.	19.8	321.	20.9	327.	20.3	319.	20.7	324.	21.1	324.	20.5	332.	19.6	329.	19.8	327.	16.6	108.
17.5	292.	15.6	291.	17.6	295.	18.9	301.	19.7	283.	18.1	279.	17.3	302.	18.1	314.	16.5	308.	16.5	307.	17.7	170.
12.1	275.	13.1	283.	13.7	290.	13.5	282.	14.9	252.	13.1	296.	13.1	288.	14.0	307.	14.1	302.	11.7	306.	15.6	172.
13.0	267.	14.4	273.	0.	0.	14.3	269.	15.0	242.	13.3	284.	12.4	266.	15.1	300.	12.4	299.	13.2	307.	18.8	166.
15.0	259.	14.3	274.	14.0	278.	14.3	280.	15.9	243.	14.1	246.	14.7	264.	14.0	332.	10.1	316.	15.8	302.	17.8	161.
14.7	260.	14.6	290.	14.9	275.	14.5	296.	14.8	245.	13.4	305.	18.3	272.	14.5	312.	15.9	331.	16.1	322.	16.3	164.

Fig. 29 TABULATED MEASURED DATA (TRANSMIT ANT, VERT POL, E 20)

SLAVE ANTENNA 60 RANGE VALUES

-20.		-16.		-12.		-8.		-4.		C.		4.		8.		12.		16.		20.	
SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE	SIGMA	PHASE
22.1	239.	17.9	276.	21.3	286.	22.8	300.	24.2	305.	25.1	324.	26.5	336.	26.9	341.	27.3	362.	27.2	339.	30.5	17.
22.1	245.	22.3	288.	23.5	304.	25.6	321.	26.9	312.	27.5	396.	28.0	7.	28.2	12.	29.2	11.	29.6	8.	23.9	5.
21.7	240.	19.6	262.	19.6	260.	19.7	280.	20.4	289.	23.8	305.	33.3	316.	23.9	328.	24.6	334.	26.7	334.	18.4	344.
21.4	235.	19.3	262.	20.5	262.	20.1	275.	20.8	274.	19.7	294.	21.1	288.	21.6	295.	22.5	298.	21.3	307.	15.8	302.
21.4	140.	19.5	219.	17.9	239.	16.6	288.	17.5	266.	18.0	273.	16.5	259.	19.4	270.	19.3	263.	18.1	254.	18.4	280.
19.9	114.	21.7	122.	19.0	171.	16.1	246.	16.0	264.	19.6	270.	22.3	272.	22.0	274.	23.2	277.	22.0	272.	22.5	333.
21.5	140.	21.4	134.	21.0	142.	16.4	216.	17.2	259.	19.8	283.	22.6	284.	24.1	332.	24.5	308.	23.0	296.	21.9	40.
20.8	147.	20.3	113.	21.3	78.	18.7	146.	16.2	226.	15.7	262.	14.2	212.	15.9	230.	16.6	169.	20.2	226.	24.9	82.
17.0	74.	16.9	30.	19.6	35.	21.5	56.	18.8	96.	17.5	113.	19.4	100.	19.4	112.	20.3	118.	22.2	102.	24.1	92.
17.3	64.	18.2	54.	20.8	52.	21.3	95.	22.2	74.	21.3	90.	19.1	110.	20.2	130.	21.0	140.	21.5	126.	17.0	32.
18.8	98.	19.9	82.	21.5	76.	21.4	53.	22.1	40.	21.4	64.	15.6	120.	13.7	166.	14.6	188.	15.5	170.	32.0	168.
24.1	134.	24.8	113.	26.3	120.	22.9	120.	21.2	128.	21.9	165.	22.1	156.	17.7	169.	22.3	182.	22.0	166.	32.2	160.
30.1	117.	30.5	125.	33.3	140.	29.5	140.	29.8	143.	30.3	150.	31.8	157.	31.2	177.	35.1	194.	32.2	161.	32.2	172.
31.5	194.	31.7	138.	27.4	136.	33.6	149.	34.2	149.	31.9	166.	33.3	162.	35.7	399.	29.6	168.	35.7	173.	29.8	134.
23.2	108.	23.7	202.	24.3	116.	26.4	146.	26.2	156.	26.4	175.	26.6	182.	29.3	202.	24.9	219.	27.7	179.	14.7	16.
14.8	58.	17.0	50.	19.6	15.	21.0	3.	22.1	67.	18.3	144.	15.3	188.	15.4	209.	16.3	233.	16.2	192.	15.1	83.
16.5	79.	17.7	64.	15.7	26.	18.9	358.	22.1	357.	19.0	114.	16.3	190.	16.5	206.	16.6	213.	16.5	164.	43.2	118.
18.4	80.	13.4	80.	21.4	76.	21.9	46.	20.9	7.	18.4	131.	16.3	169.	17.6	187.	18.4	190.	18.8	173.	26.8	100.
19.5	83.	23.6	75.	21.7	74.	22.1	77.	21.8	22.	18.1	132.	17.9	158.	19.1	168.	16.4	174.	19.2	188.	23.3	76.
18.0	70.	20.3	72.	21.4	63.	22.1	74.	22.0	48.	18.9	114.	16.6	132.	16.8	135.	16.5	165.	18.1	130.	31.6	35.
15.6	357.	17.8	355.	19.9	0.	21.0	11.	20.9	7.	22.3	30.	18.8	61.	17.6	67.	16.1	72.	18.2	90.	31.9	28.
23.4	346.	24.6	352.	26.2	2.	26.2	9.	27.0	8.	26.7	20.	25.7	39.	27.1	38.	26.5	68.	27.9	29.	32.6	29.
29.9	358.	31.4	7.	32.1	11.	32.4	13.	32.9	11.	32.6	15.	32.8	24.	33.2	39.	32.0	66.	32.8	18.	26.4	21.
30.7	14.	31.4	16.	31.5	30.	32.4	26.	32.5	19.	31.5	32.	32.9	33.	32.3	37.	31.6	65.	32.6	24.	26.0	353.
30.9	73.	31.5	64.	30.6	52.	29.2	52.	31.7	44.	30.7	48.	33.1	44.	29.9	36.	28.6	38.	27.7	14.	30.7	208.
28.5	98.	28.1	89.	27.1	76.	27.9	62.	27.6	30.	25.5	5.	27.3	0.	25.6	330.	26.0	339.	24.3	316.	17.1	206.
25.9	144.	24.1	148.	22.5	145.	22.9	77.	16.0	220.	16.5	228.	17.0	232.	18.1	248.	20.7	298.	21.0	245.	10.2	210.
20.4	178.	20.8	118.	72.4	100.	21.3	359.	18.2	106.	17.7	211.	18.9	214.	19.2	217.	19.9	234.	19.8	214.	24.4	136.
17.4	104.	18.4	44.	17.3	337.	16.1	290.	16.5	100.	15.6	204.	16.3	201.	15.7	212.	16.8	220.	17.8	194.	25.3	342.
16.5	105.	16.4	348.	14.3	274.	14.6	224.	17.3	167.	19.9	188.	17.7	176.	18.8	181.	19.2	181.	20.7	194.	14.7	11.
21.4	168.	18.5	226.	17.7	214.	18.3	206.	23.6	183.	19.0	194.	21.6	199.	21.7	201.	22.7	194.	22.0	169.	26.4	35.
20.8	136.	21.4	132.	22.0	132.	21.3	135.	21.4	116.	21.6	123.	16.2	143.	16.7	144.	15.3	136.	17.2	97.	41.7	69.
26.5	118.	26.4	103.	24.6	105.	25.8	106.	25.0	93.	26.6	98.	3.	3.	23.1	81.	22.8	74.	84.0	60.	33.2	68.
30.9	109.	31.2	100.	31.4	99.	30.9	105.	31.2	98.	31.2	102.	31.7	86.	30.4	94.	29.0	87.	28.9	76.	37.0	32.
30.5	68.	30.9	68.	32.0	74.	32.4	[illegible]	32.7	70.	32.1	75.	35.4	76.	32.9	78.	31.9	78.	32.4	70.	36.9	15.
37.3	50.	37.1	45.	37.6	56.	37.9	65.	38.1	56.	37.6	62.	38.3	60.	37.2	72.	36.4	66.	36.3	44.	30.0	357.
37.6	13.	38.7	16.	38.6	16.	39.0	30.	39.9	12.	38.2	26.	43.7	15.	38.2	37.	38.4	14.	36.9	12.	38.0	8.
35.9	7.	38.2	3.	30.4	8.	39.2	12.	38.8	9.	35.9	9.	40.8	10.	39.5	11.	38.8	6.	38.8	354.	34.6	26.
31.0	33.	35.8	12.	37.9	10.	38.7	12.	39.0	13.	39.7	15.	37.7	24.	39.7	13.	40.2	11.	39.1	12.	38.2	69.
29.5	96.	33.0	81.	32.2	78.	32.5	77.	32.9	78.	34.4	72.	34.1	78.	35.0	72.	35.3	70.	34.7	66.	30.2	121.
31.1	180.	33.1	174.	29.7	160.	35.1	156.	30.5	149.	31.0	146.	32.1	167.	32.5	142.	32.9	134.	33.9	302.	19.4	297.
30.2	252.	29.6	245.	29.3	239.	28.5	240.	27.7	241.	28.0	226.	28.8	222.	27.8	210.	28.8	191.	28.2	198.	36.6	309.
30.1	294.	29.5	296.	29.8	303.	29.7	308.	30.1	314.	29.1	312.	29.3	313.	28.9	307.	28.3	309.	28.7	294.	41.2	338.
35.7	303.	36.4	305.	37.0	314.	37.1	330.	37.1	329.	37.1	336.	37.1	342.	37.0	340.	36.8	338.	36.7	313.	35.7	320.
39.4	322.	3.	3.	41.2	338.	41.2	343.	41.4	346.	41.3	348.	41.4	356.	40.4	354.	41.3	356.	43.3	330.	24.1	216.
35.7	304.	35.8	302.	35.0	308.	36.7	332.	36.4	325.	36.2	323.	36.6	339.	34.9	321.	36.0	334.	36.1	324.	24.2	176.
26.9	247.	27.2	243.	27.0	240.	27.2	245.	26.8	252.	25.5	251.	25.1	251.	25.1	248.	25.2	243.	25.3	229.	22.3	134.
24.7	168.	24.9	192.	24.6	214.	23.7	232.	23.7	226.	23.1	214.	24.9	220.	23.4	217.	25.0	229.	25.4	210.	22.3	83.
23.7	105.	21.9	103.	22.6	108.	21.7	120.	21.7	119.	23.7	121.	19.8	135.	19.8	132.	18.6	136.	19.0	190.	32.1	100.
24.9	98.	26.1	94.	26.3	93.	25.1	107.	26.1	104.	23.0	101.	22.9	110.	21.7	108.	22.4	114.	21.5	89.	21.0	160.
28.0	125.	26.5	136.	27.1	119.	26.2	129.	24.7	120.	24.4	124.	23.3	132.	22.3	129.	21.4	133.	22.2	114.	21.3	204.
27.6	160.	26.3	150.	26.2	161.	23.6	183.	25.3	172.	25.4	170.	25.3	184.	23.4	180.	23.4	190.	22.7	167.	22.1	263.
24.3	162.	24.4	155.	23.5	158.	21.2	200.	22.1	206.	22.3	207.	22.8	214.	22.7	220.	23.4	224.	20.9	204.	22.0	241.
15.4	36.	18.0	6.	19.3	354.	20.1	202.	17.9	263.	17.8	269.	19.8	276.	21.2	283.	21.8	282.	22.6	292.	21.9	220.
13.7	0.	16.7	337.	16.1	331.	19.6	201.	15.6	263.	17.8	282.	22.1	254.	21.0	259.	22.1	259.	22.0	259.	16.5	172.
13.6	6.	15.1	321.	15.0	302.	19.2	180.	15.5	214.	17.4	231.	13.1	221.	20.4	222.	20.1	236.	20.2	214.	15.4	139.
13.4	67.	14.2	325.	14.2	297.	18.8	130.	14.6	197.	15.2	189.	[illegible]	193.	14.8	177.	14.5	220.	16.4	170.	16.6	131.
16.9	98.	14.5	358.	16.5	309.	19.9	103.	13.2	164.	13.0	164.	18.2	168.	15.2	160.	11.6	199.	19.1	190.	18.4	132.
18.2	94.	15.6	44.	16.5	352.	21.2	64.	15.2	144.	13.2	168.	12.1	164.	14.9	159.	13.0	201.	15.1	143.	15.9	146.
16.4	91.	14.0	72.	16.9	10.	20.9	11.	18.7	113.	14.9	156.	12.3	175.	14.3	177.	13.3	219.	13.6	162.	37.2	339.

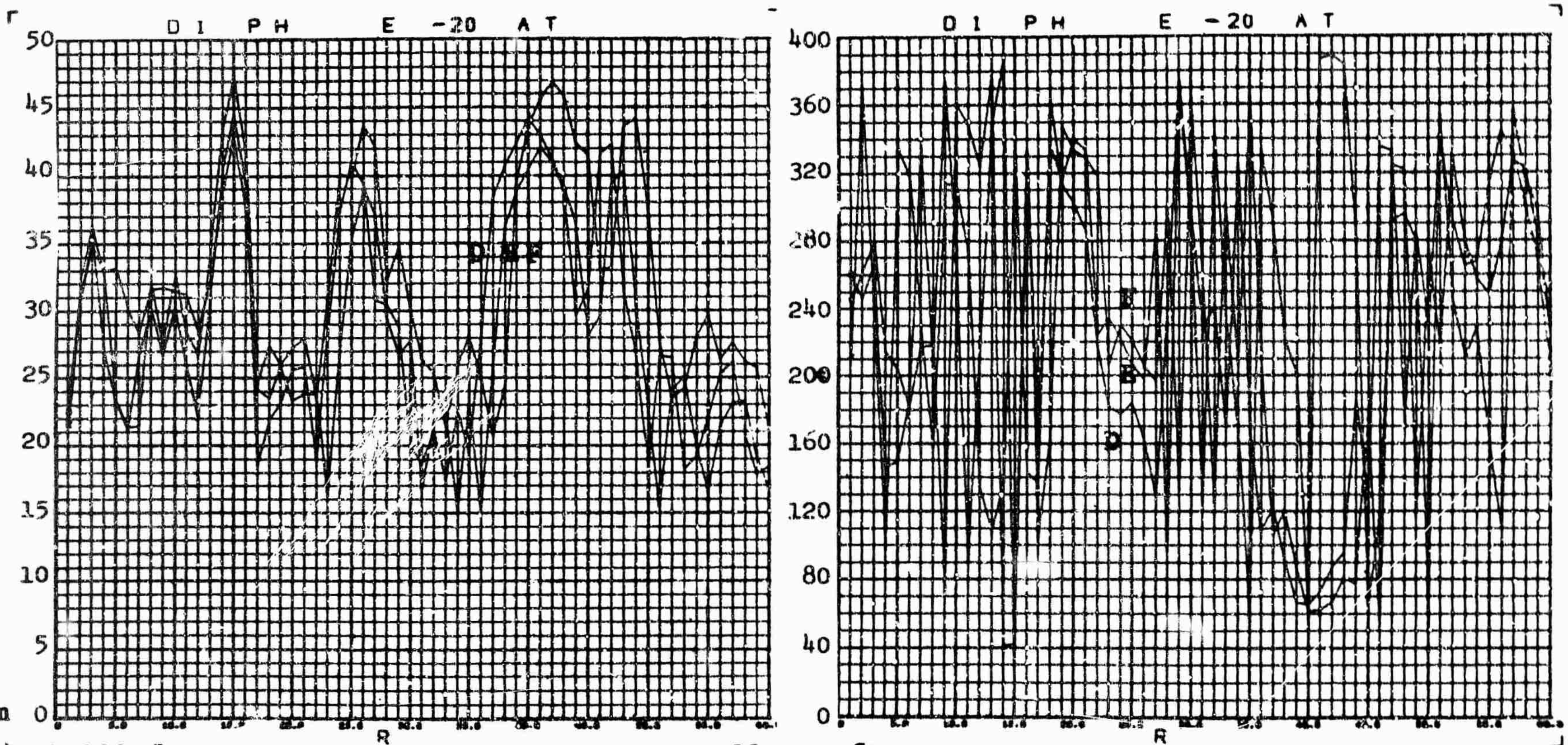
Fig. 30 TABULATED MEASURED DATA (SLAVE ANT, VERT POL, E 20)

C O M P U T E D   D A T A

DAY NUMBER- 4   POLARISATION- VERT   ELEVATION- 20

-20.		-16.		-12.		-8.		-4.		0.		4.		8.		12.		16.		20.	
DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI	DA	DPHI
20.3	151.	9.4	104.	18.9	172.	3.6	92.	9.6	10.	0.1	72.	25.6	126.	3.3	47.	0.7	36.	0.1	42.	6.6	66.
12.6	133.	4.2	113.	23.2	178.	0.7	88.	1.0	73.	1.7	60.	27.9	125.	1.5	33.	3.4	23.	3.3	34.	4.2	30.
6.6	177.	1.4	63.	19.1	157.	0.5	36.	1.6	32.	3.7	32.	23.8	161.	7.0	22.	3.7	14.	7.4	10.	1.3	5.
0.1	95.	3.8	62.	5.1	103.	2.2	65.	1.2	62.	2.7	48.	2.0	64.	0.3	67.	1.3	39.	0.1	31.	2.4	35.
1.4	172.	1.8	104.	2.1	101.	4.6	71.	3.7	69.	3.2	61.	2.3	85.	1.7	79.	0.1	69.	2.4	84.	1.4	86.
3.9	122.	2.3	139.	4.4	171.	8.0	117.	6.4	95.	3.6	78.	2.3	98.	3.1	90.	0.3	89.	2.2	89.	3.1	72.
1.9	133.	2.6	133.	2.5	123.	6.2	135.	6.3	119.	3.9	88.	3.5	103.	1.1	86.	1.9	96.	1.3	88.	3.0	94.
13.3	83.	12.8	320.	13.1	154.	11.6	92.	6.8	23.	9.9	15.	7.4	39.	9.6	34.	6.0	107.	13.0	59.	6.4	81.
2.4	121.	9.3	156.	2.5	165.	4.4	132.	2.9	37.	3.6	93.	3.3	119.	4.7	104.	6.0	91.	7.9	111.	6.6	83.
2.3	132.	1.5	162.	6.1	166.	5.1	168.	5.4	143.	5.9	124.	3.7	125.	4.4	136.	3.1	71.	9.5	96.	8.4	116.
12.3	147.	12.3	158.	14.6	170.	14.3	166.	16.5	133.	18.0	176.	13.3	148.	9.9	111.	6.6	40.	10.1	84.	8.8	68.
5.0	134.	[illegible]	136.	8.7	123.	5.0	129.	4.6	112.	1.8	108.	1.7	124.	4.5	93.	3.3	60.	3.7	81.	0.1	83.
1.2	131.	1.3	122.	4.8	120.	6.4	131.	0.8	111.	3.6	113.	3.6	135.	0.7	99.	6.0	58.	4.3	90.	6.2	63.
0.2	126.	1.7	122.	5.4	133.	0.1	128.	0.8	117.	0.8	138.	1.9	124.	3.7	117.	5.9	66.	5.9	94.	7.4	131.
4.3	163.	3.7	172.	3.1	172.	1.9	139.	1.3	120.	1.9	199.	2.9	114.	1.6	84.	0.6	64.	0.6	107.	7.3	164.
2.3	133.	3.3	113.	0.6	68.	3.6	90.	3.1	118.	3.	156.	4.3	134.	3.0	113.	1.6	79.	4.1	119.	5.2	141.
1.3	139.	3.1	136.	4.0	93.	3.4	65.	5.6	60.	3.4	177.	2.3	132.	1.8	107.	2.3	91.	0.3	124.	6.6	96.
1.7	173.	3.5	179.	4.8	176.	4.1	133.	4.6	96.	2.0	141.	3.6	118.	1.3	99.	1.9	90.	2.3	109.	5.1	184.
4.7	161.	4.9	166.	3.8	172.	5.7	170.	6.0	124.	1.4	136.	1.7	118.	3.3	104.	3.4	87.	2.5	111.	3.7	136.
6.6	145.	4.9	148.	7.9	139.	6.9	136.	9.5	178.	4.3	115.	3.4	112.	3.3	111.	3.5	88.	5.6	102.	1.9	88.
3.7	144.	9.3	159.	8.8	139.	10.3	133.	13.8	133.	14.4	136.	13.8	112.	12.6	111.	9.3	95.	11.7	118.	6.7	87.
2.1	129.	0.6	122.	3.2	117.	1.9	[illegible]	3.5	113.	4.7	104.	3.4	103.	6.7	88.	5.8	48.	4.9	96.	1.3	81.
0.3	115.	2.3	111.	2.3	109.	1.9	115.	2.3	107.	2.9	134.	3.7	106.	4.4	91.	2.4	74.	3.8	99.	4.0	99.
4.7	104.	1.6	108.	3.9	93.	2.7	106.	3.2	134.	4.7	89.	4.5	95.	5.1	87.	2.2	80.	3.3	92.	2.3	119.
4.4	24.	9.1	42.	4.0	32.	3.9	60.	5.8	49.	4.4	39.	5.4	63.	4.9	62.	1.1	59.	0.8	83.	0.6	120.
4.0	100.	4.6	82.	4.3	64.	3.3	48.	4.1	32.	1.5	9.	1.9	6.	0.1	34.	3.2	39.	1.9	65.	2.6	86.
5.7	140.	4.7	153.	3.5	167.	3.4	131.	3.9	95.	3.2	96.	13.3	69.	3.4	74.	1.1	39.	1.8	75.	3.9	58.
1.6	139.	3.4	173.	1.6	162.	0.1	60.	2.6	114.	3.4	92.	2.1	83.	0.3	91.	1.6	71.	0.7	92.	2.0	88.
0.4	180.	3.0	113.	1.3	49.	0.3	3.	0.3	113.	0.9	94.	5.6	97.	1.5	97.	1.0	82.	2.2	110.	1.7	71.
3.2	153.	1.2	86.	3.0	13.	3.8	50.	1.2	101.	2.2	84.	3.3	104.	1.1	104.	1.2	91.	3.1	133.	5.6	149.
0.3	95.	1.6	44.	2.4	56.	2.3	73.	0.5	93.	1.6	76.	4.3	87.	0.1	88.	2.6	85.	3.0	112.	4.1	113.
7.6	37.	9.6	84.	9.9	72.	10.6	79.	10.1	102.	11.3	90.	3.5	66.	3.6	97.	6.3	93.	7.2	131.	4.9	87.
4.5	44.	4.3	37.	5.0	59.	3.2	69.	4.4	73.	3.7	74.	10.3	166.	2.3	98.	2.6	85.	3.3	104.	2.6	92.
1.4	63.	2.3	63.	1.8	73.	2.1	86.	1.6	84.	2.0	76.	1.3	67.	1.5	102.	0.6	79.	0.1	98.	3.8	116.
1.3	76.	1.5	78.	0.5	72.	0.1	73.	0.5	76.	0.1	75.	3.1	62.	1.7	76.	0.	65.	0.3	70.	1.6	121.
1.5	90.	1.3	97.	2.4	80.	2.2	78.	2.7	90.	0.2	83.	3.0	77.	2.4	60.	2.0	67.	1.9	94.	3.4	96.
1.8	79.	2.2	84.	2.6	74.	3.2	76.	5.7	88.	2.2	79.	5.3	100.	3.4	61.	2.6	73.	1.0	99.	0.2	76.
1.9	65.	0.2	69.	0.7	44.	1.3	63.	0.8	66.	0.9	69.	[illegible]	66.	1.8	69.	0.6	68.	1.3	80.	1.2	64.
7.9	43.	3.0	60.	3.	71.	0.3	70.	0.2	67.	1.3	67	1.6	68.	1.8	73.	1.2	67.	0.2	66.	1.8	53.
2.4	61.	3.3	55.	1.2	60.	0.6	62.	0.1	54.	2.4	66.	1.2	65.	3.4	76.	7.5	137.	3.8	94.	0.4	84.
1.8	40.	0.5	38.	0.4	50.	0.4	59.	0.5	64.	1.0	64.	3.3	71.	4.5	84.	3.9	118.	5.6	119.	3.2	13.
4.1	49.	3.1	44.	2.5	43.	1.3	48.	3.4	53.	0.2	62.	3.4	71.	0.3	48.	7.0	148.	2.6	150.	9.2	77.
1.5	86.	0.4	84.	0.9	79.	3.6	83.	1.2	58.	0.9	71.	3.2	73.	1.1	81.	11.4	107.	2.8	87.	1.0	81.
0.	98.	0.2	[illegible]	0.6	92.	1.3	89.	1.3	79.	2.0	74.	1.6	78.	1.4	76.	2.9	33.	1.1	86.	4.6	107.
0.2	98.	[illegible]	63.	1.0	87.	1.4	88.	1.4	78.	2.3	76.	3.3	72.	1.9	74.	13.3	19.	1.9	83.	10.6	137.
0.7	89.	1.0	88.	0.2	88.	1.6	73.	1.7	70.	1.4	72.	2.9	46.	3.3	49.	1.7	52.	1.4	66.	1.2	149.
1.6	69.	1.3	74.	2.3	61.	2.0	63.	1.9	68.	3.1	75.	0.9	72.	3.2	76.	0.7	73.	0.1	91.	1.8	178.
2.0	130.	1.4	103.	0.	86.	0.3	71.	0.2	73.	3.5	80.	3.3	81.	0.1	61.	0.1	79.	1.5	94.	0.1	107.
3.2	117.	4.1	119.	3.3	101.	2.3	92.	4.8	97.	3.7	97.	1.9	91.	3.9	88.	2.5	77.	2.7	84.	0.3	68.
4.8	102.	4.8	103.	6.1	101.	3.4	99.	7.5	89.	2.3	95.	1.6	92.	3.5	69.	3.3	78.	2.3	99.	3.8	32.
6.3	92.	3.0	95.	6.7	93.	4.4	93.	4.6	96.	2.9	96.	1.8	85.	2.0	89.	3.0	76.	2.6	96.	3.5	30.
4.2	192.	1.6	133.	3.3	99.	1.4	90.	1.6	85.	3.4	93.	2.8	92.	0.1	86.	0.3	77.	0.6	98.	1.3	11.
0.6	132.	1.8	134.	2.9	141.	1.3	104.	0.1	93.	1.2	90.	3.6	97.	0.2	89.	0.6	78.	1.5	97.	3.1	41.
7.3	58.	4.2	26.	3.7	3.	3.7	148.	4.7	85.	4.8	75.	4.1	58.	1.5	73.	0.3	70.	0.	97.	3.4	44.
8.4	48.	4.1	35.	3.7	10.	1.3	126.	4.7	39.	2.9	62.	1.0	70.	0.5	73.	2.5	71.	3.0	92.	0.1	14.
3.9	84.	1.5	30.	2.6	4.	0.3	121.	3.2	66.	0.7	67.	2.1	81.	2.3	92.	3.6	72.	3.7	95.	3.3	31.
1.3	152.	3.1	45.	2.3	17.	3.3	152.	0.5	55.	2.1	97.	1.6	94.	0.8	130.	0.4	82.	4.7	127.	2.0	41.
3.9	169.	2.1	88.	16.5	32.	5.6	163.	1.8	78.	3.3	120.	3.6	98.	3.1	140.	0.8	100.	1.9	157.	3.4	34.
3.2	164.	1.3	130.	2.5	74.	7.2	144.	0.7	96.	0.9	130.	2.6	130.	3.3	147.	2.9	113.	1.3	160.	2.0	15.
0.7	169.	0.6	142.	2.1	95.	5.4	75.	3.9	145.	1.5	149.	9.7	97.	0.2	135.	2.0	112.	2.9	160.	0.9	175.

Fig. 31 TABULATED DIFFERENTIAL DATA (VERT POL, E 20)



19 dBsm),000 ft. 90; ft.

Fig. 32 PLOTTED MEASURED DAT TRANSMIT ANT, HOR POL, E-20)

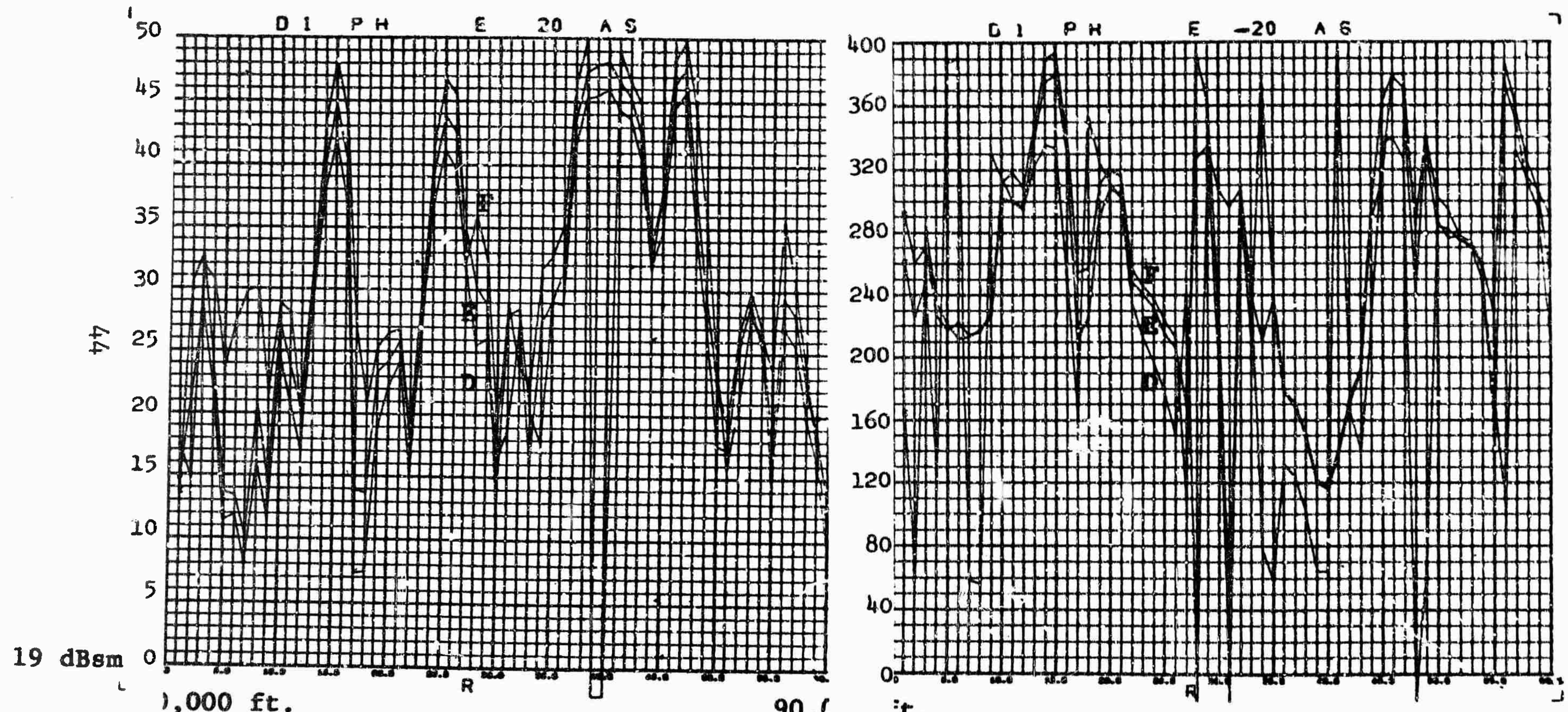


Fig. 33 PLOTTED MEASURED DAT LAVE ANT, HOR POL, E-20)

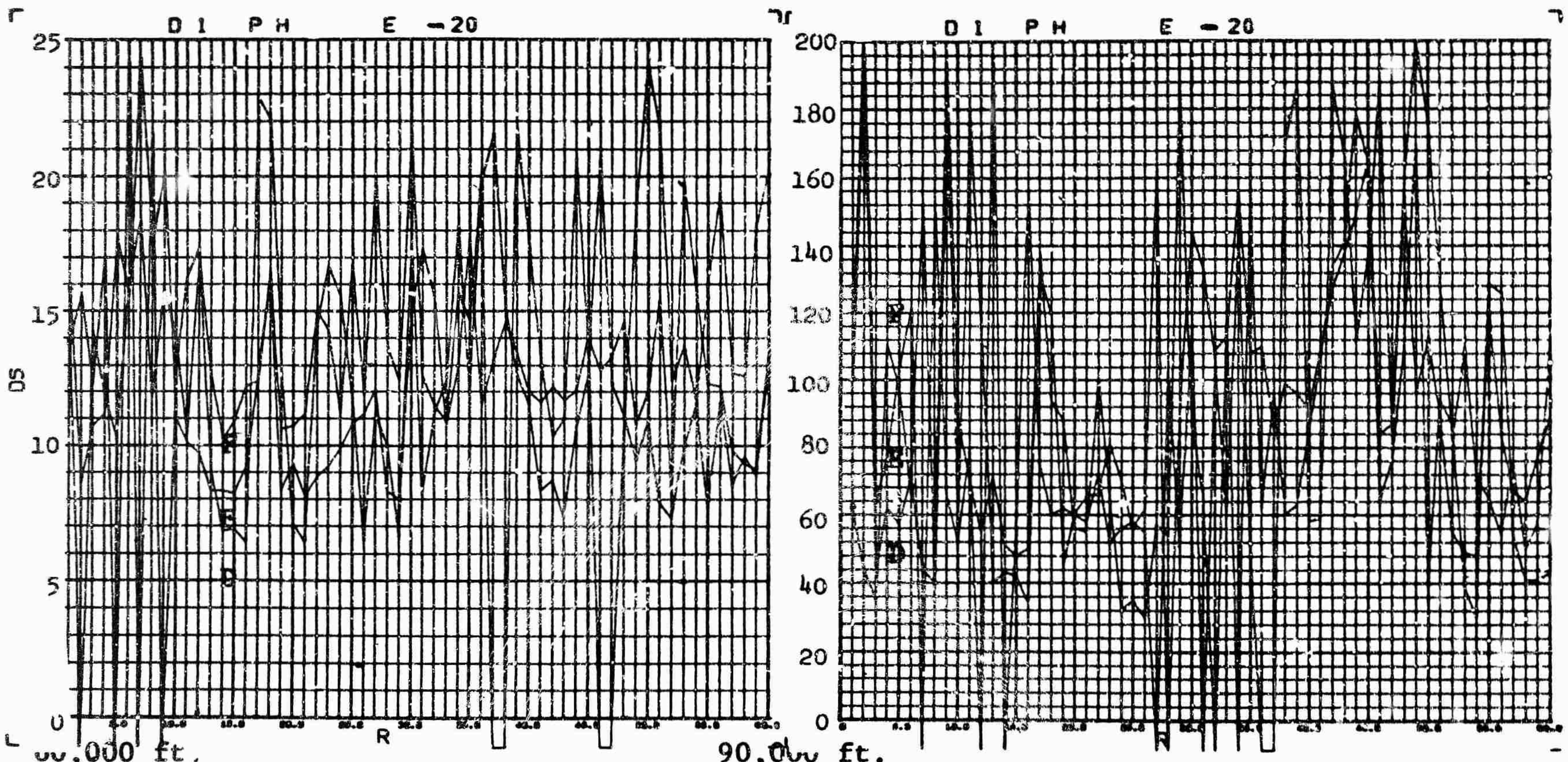


Fig. 34 PLOTTED DIFFERENTIAL DATA (HOR POL, E-20)

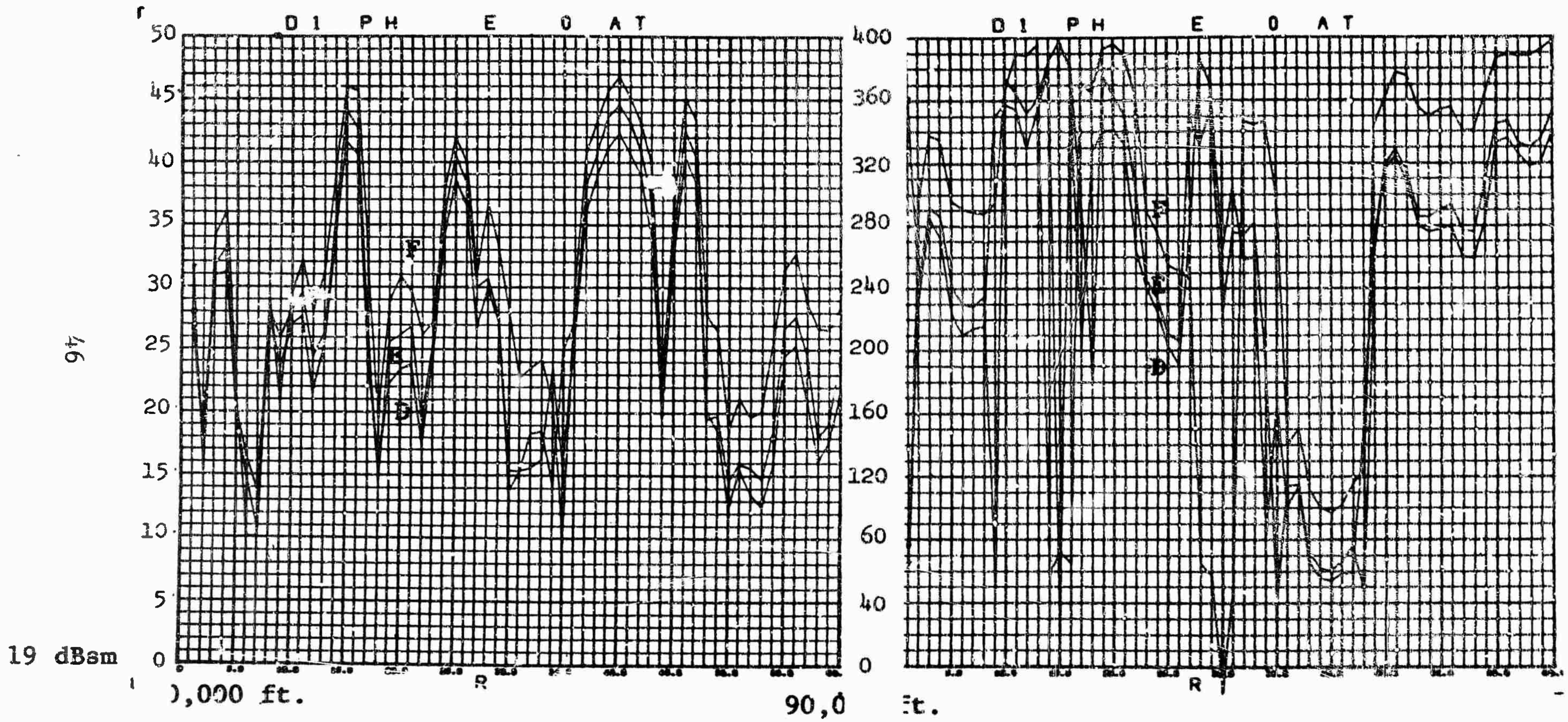


Fig. 35 PLOTTED MEASURED DAT. RANSMIT ANT, HOR POL, E-0)

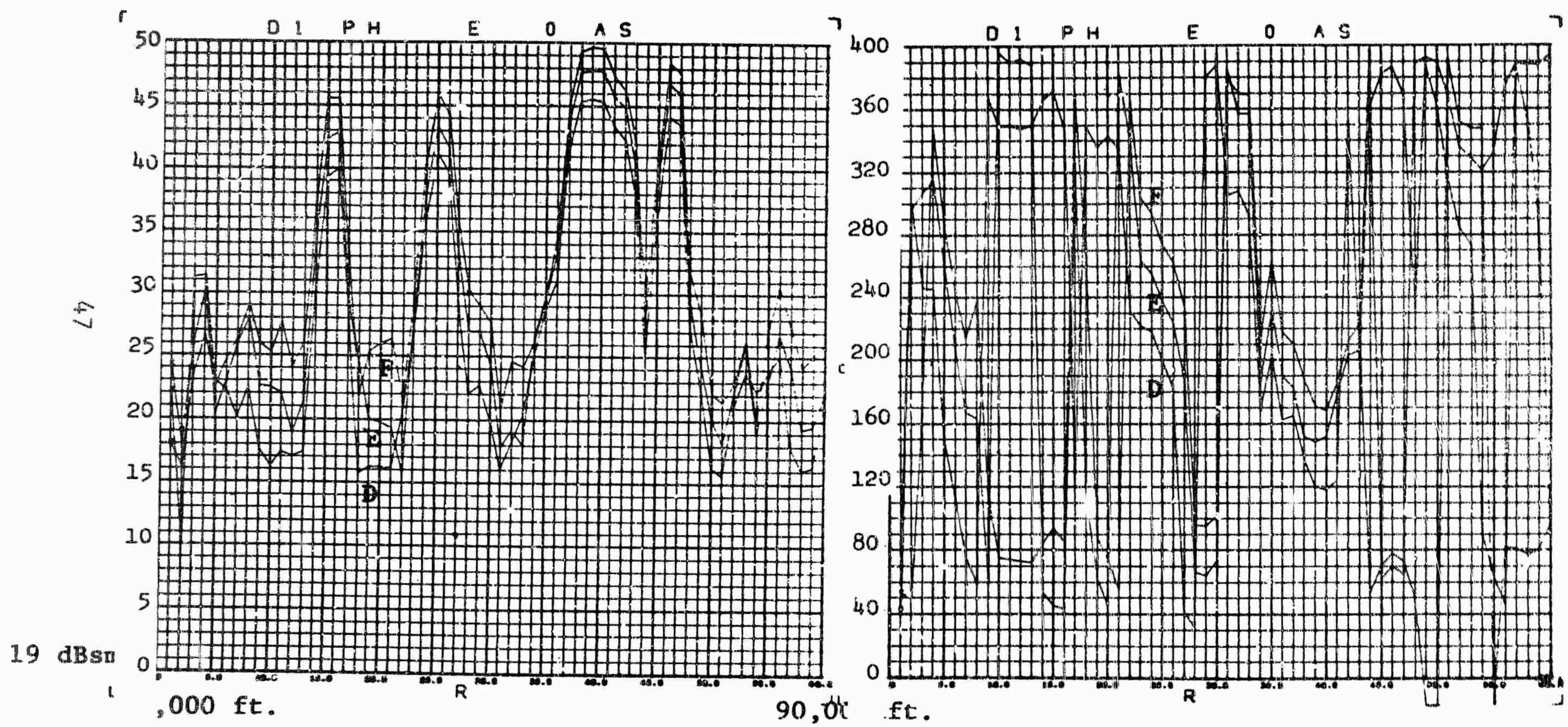


Fig. 36 PLOTTED MEASURED DATA LAVE ANT, HOR POL, E-0)

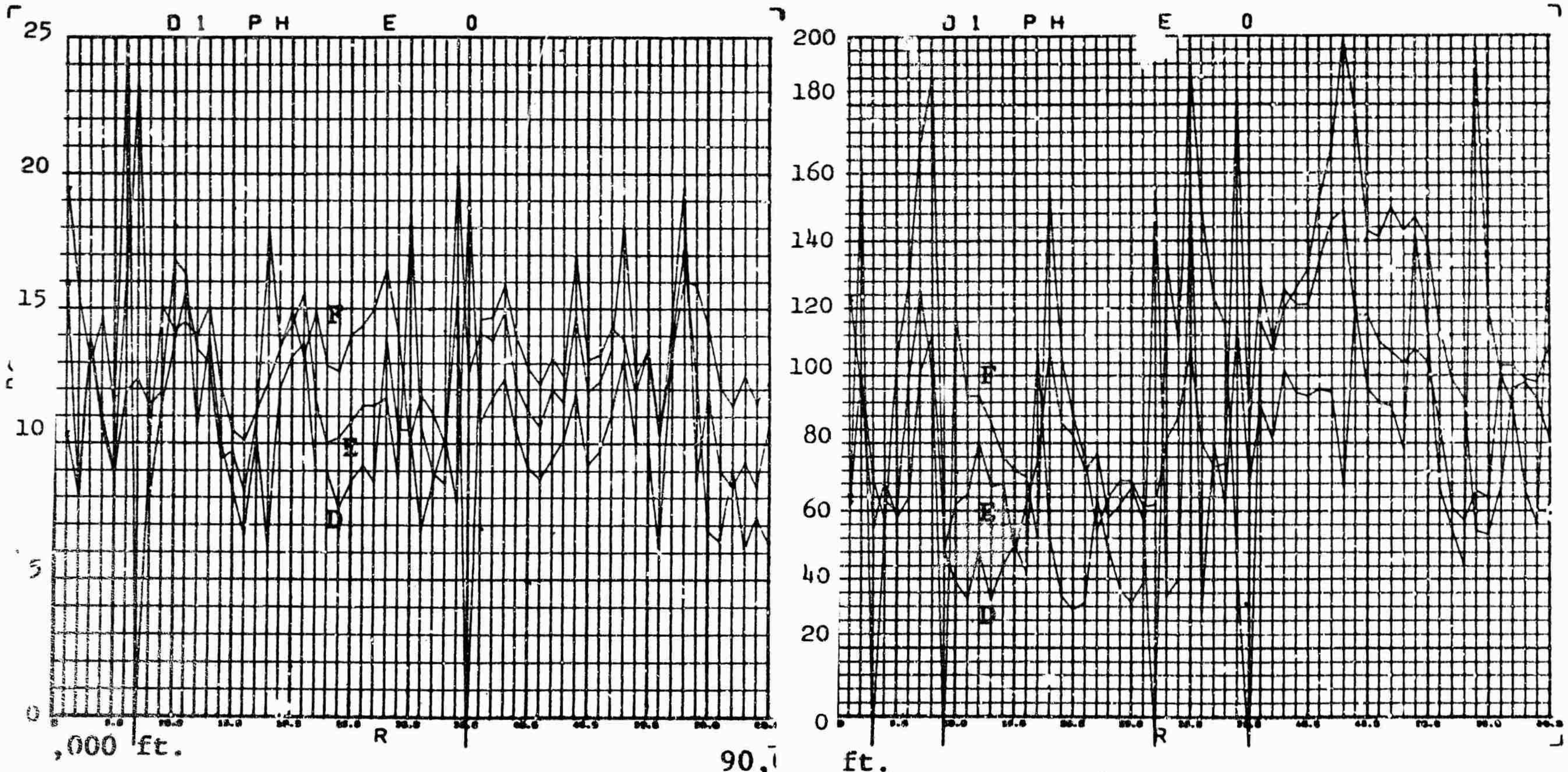
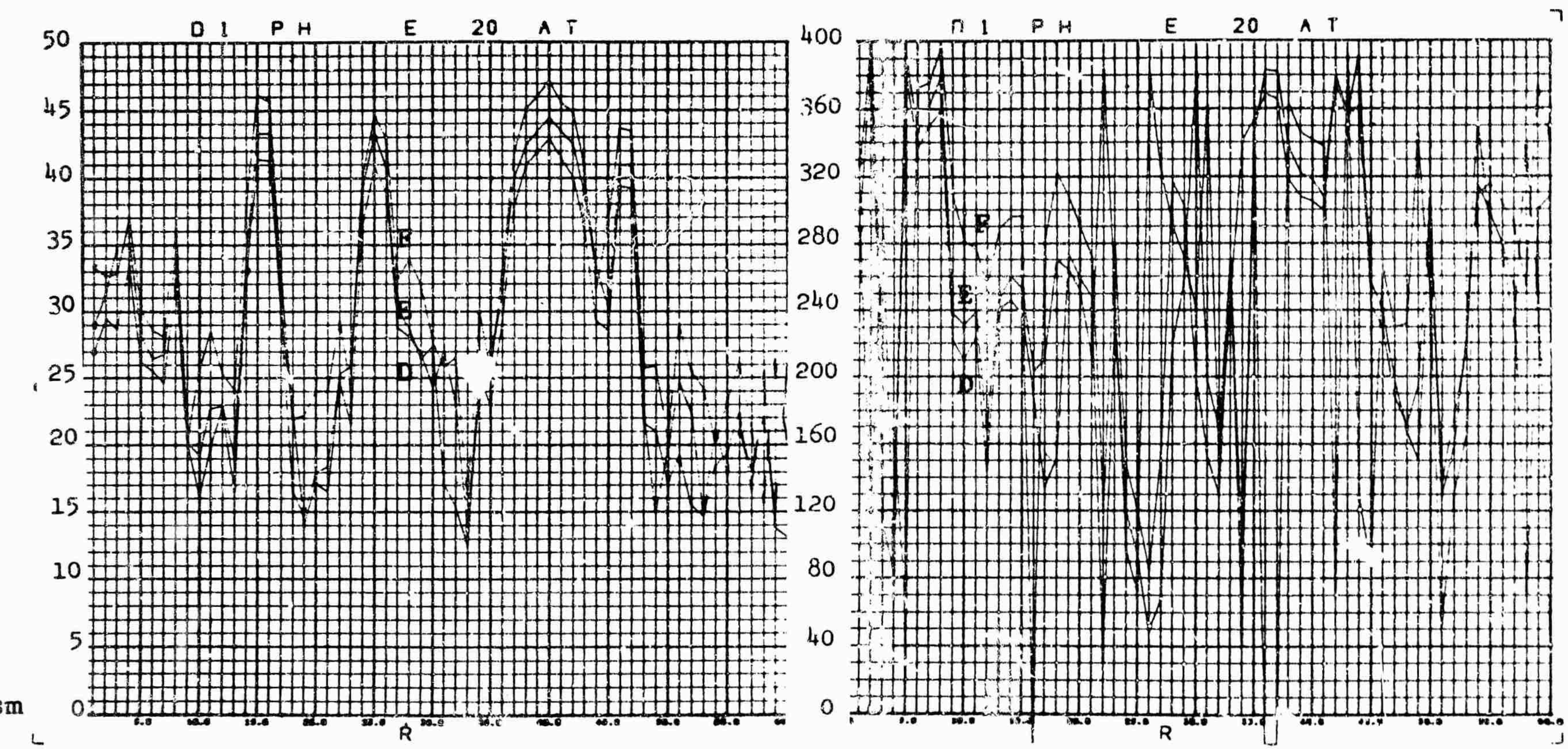


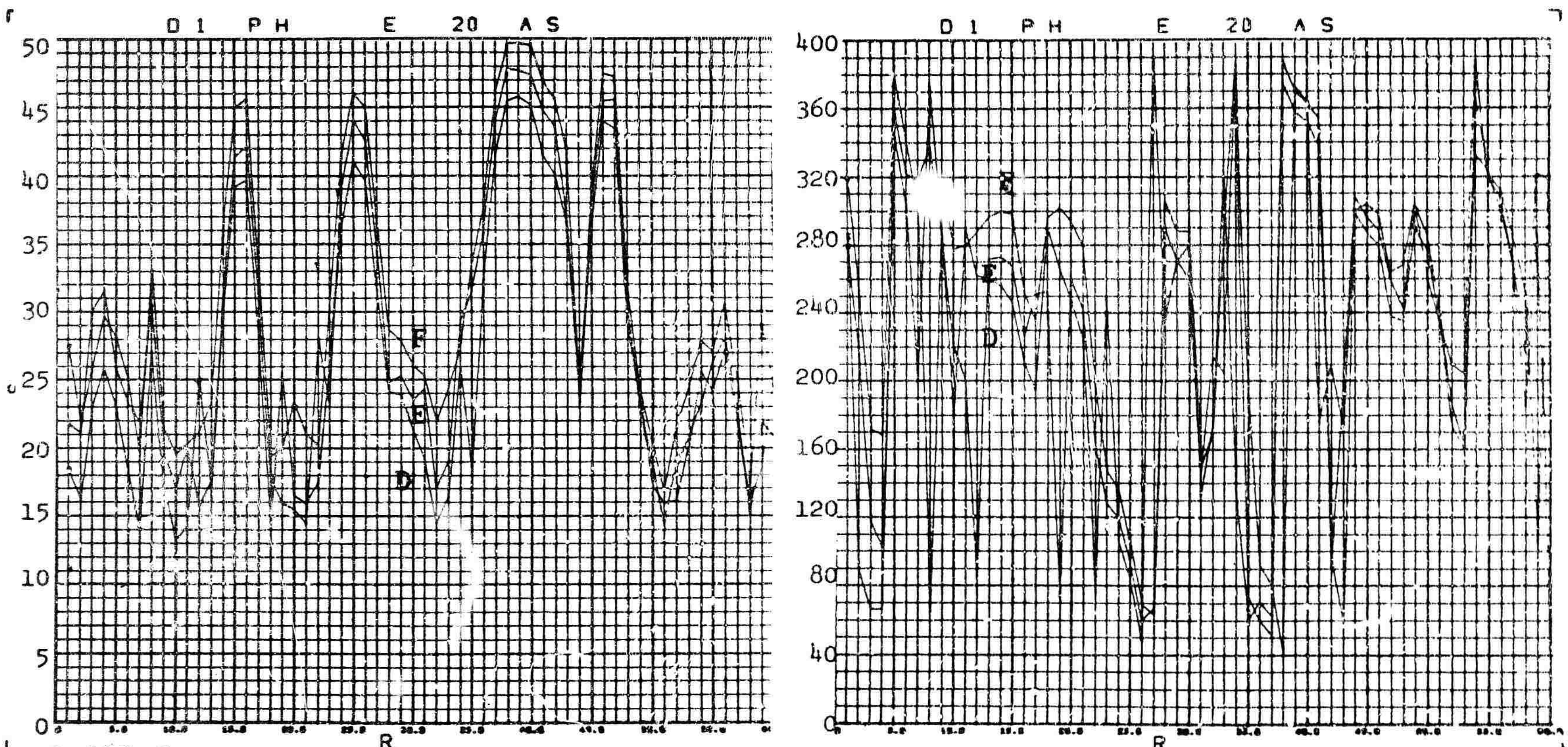
Fig. 37 PLOTTED DIFFERENTIAL A (HOR POL, E-0)



19 dBsm

,000 ft. 90, ft.

Fig. 38 PLOTTED MEASURED DA TRANSMIT ANT, HOR POL, E 20)



19 dBsm

),000 ft. 90,0 ft.

Fig. 39 PLOTTED MEASURED DA (SLAVE ANT, HOR POL, E 20)

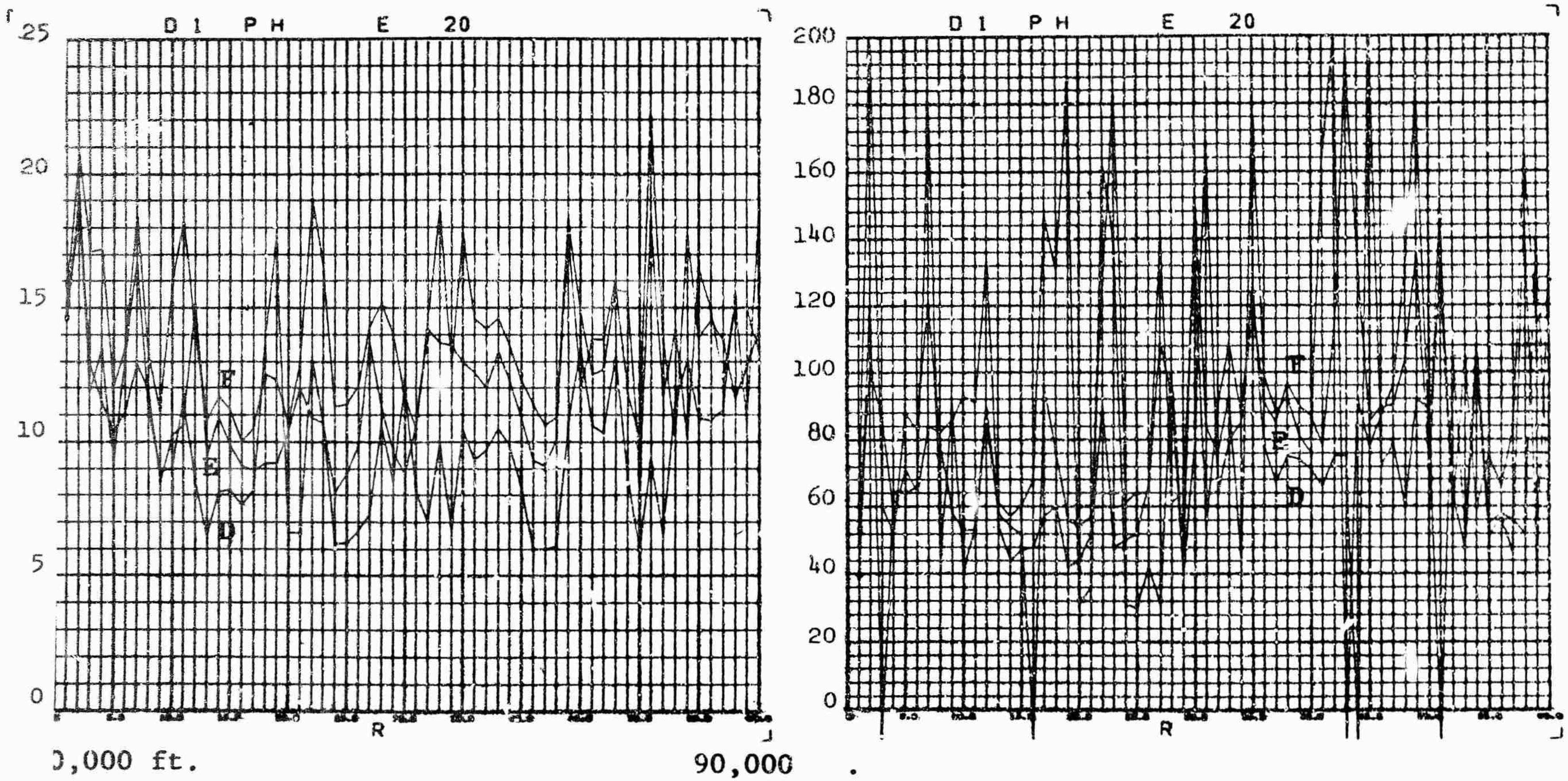


Fig. 40 PLOTTED DIFFERENTIAL D... (HOR POL, E 20)

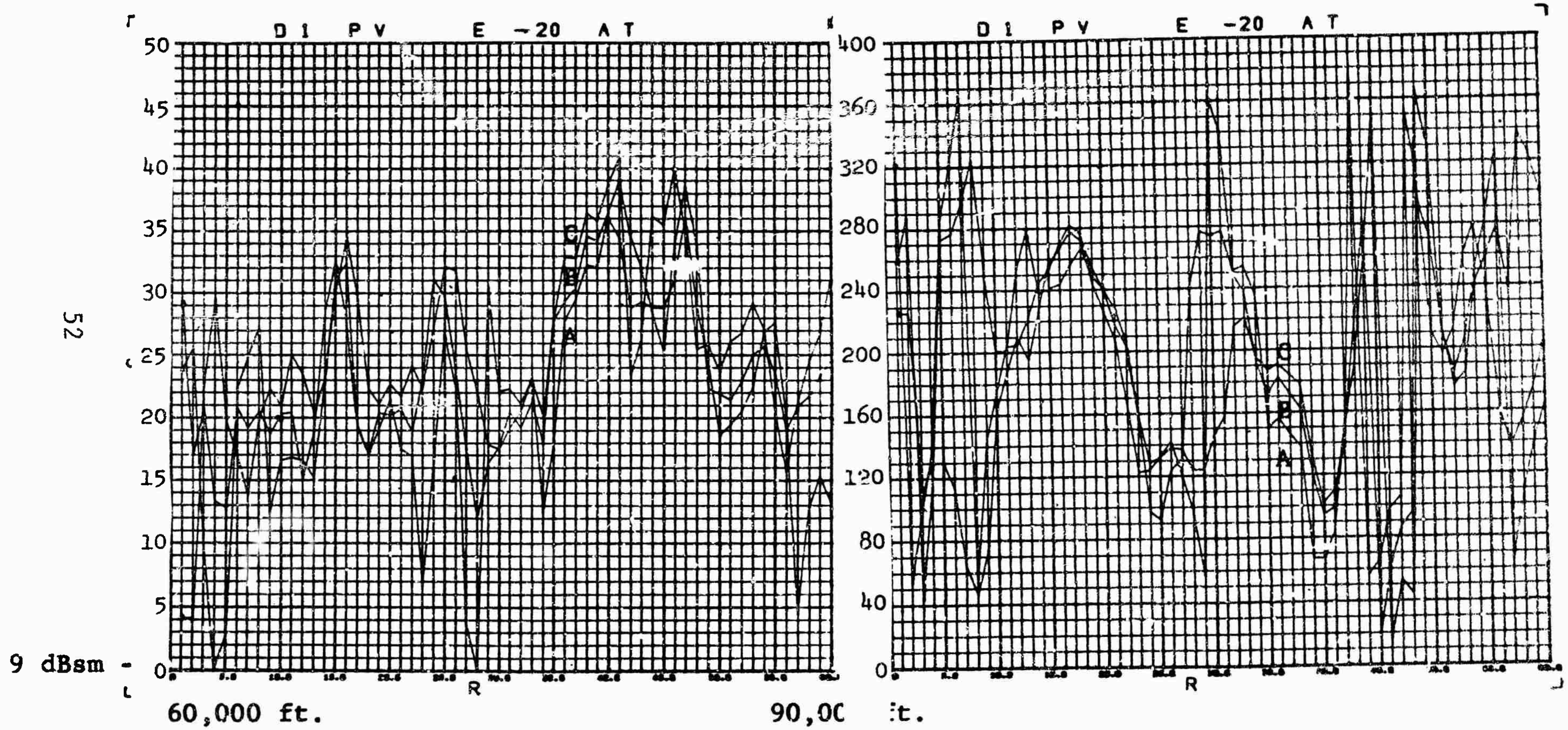
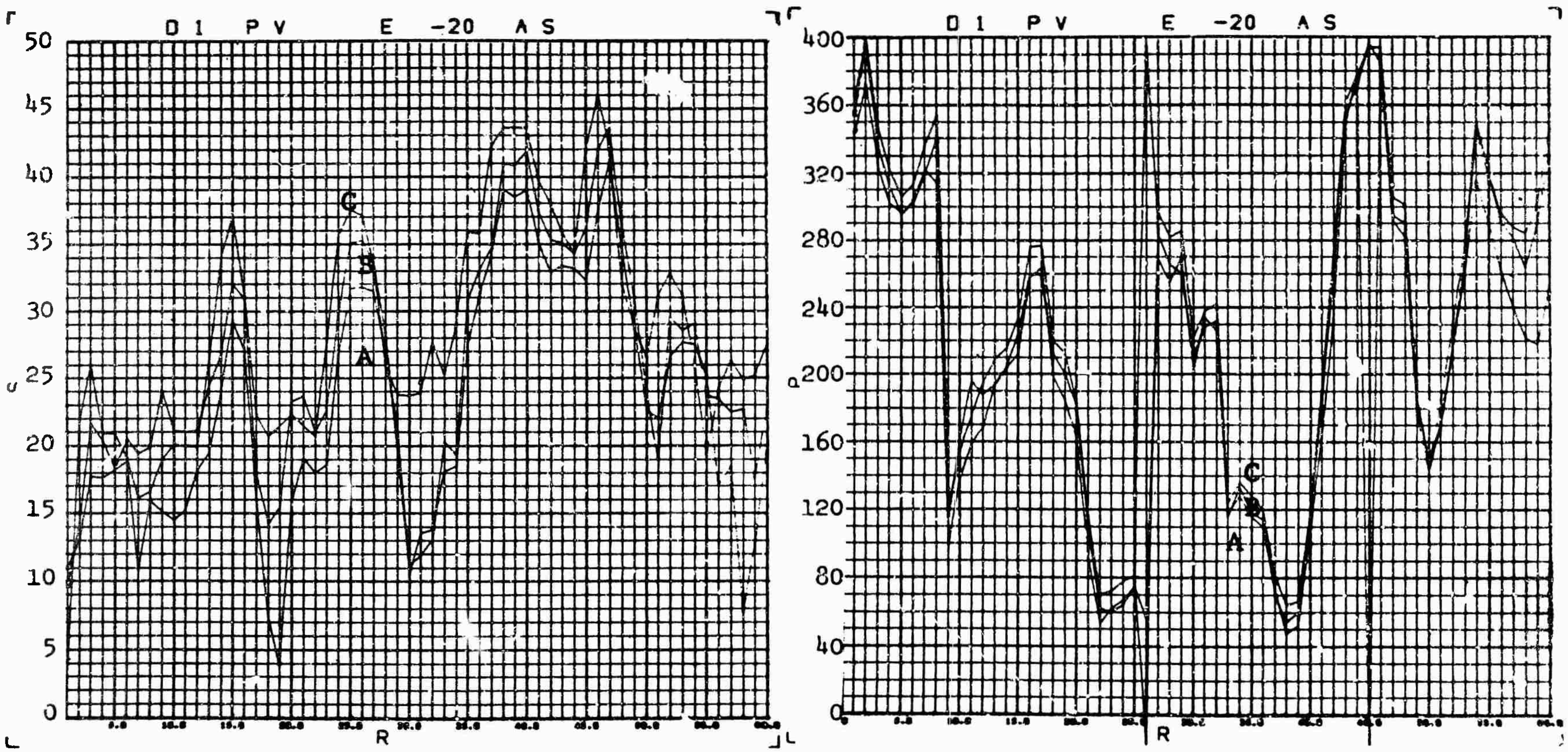


Fig. 41 PLOTTED MEASURED DATA \-TRANSMIT ANT, VERT POL, E-20)



9 dBsm

000 ft. 90,000

Fig. 42 PLOTTED MEASURED DATA (SLAVE ANT, VERT POL, E-20)

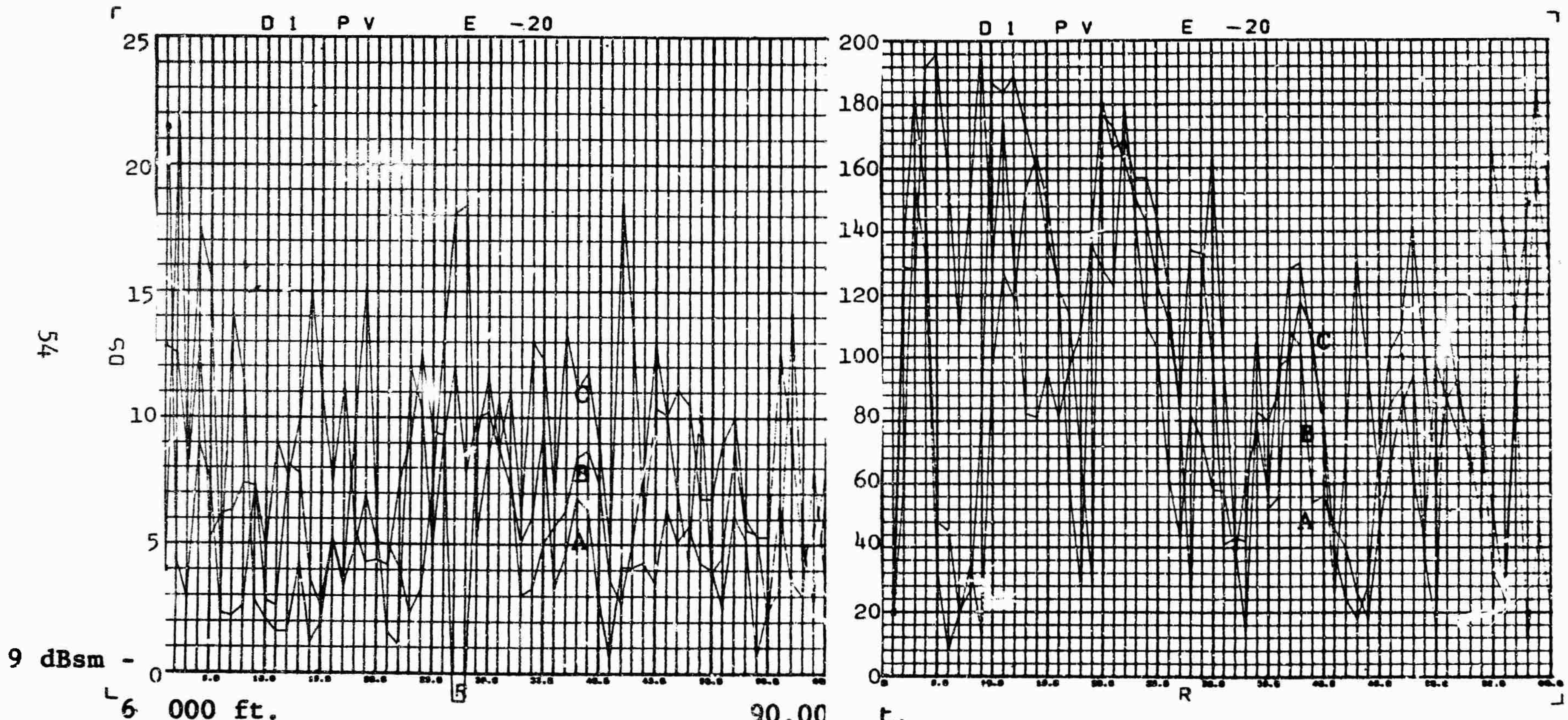
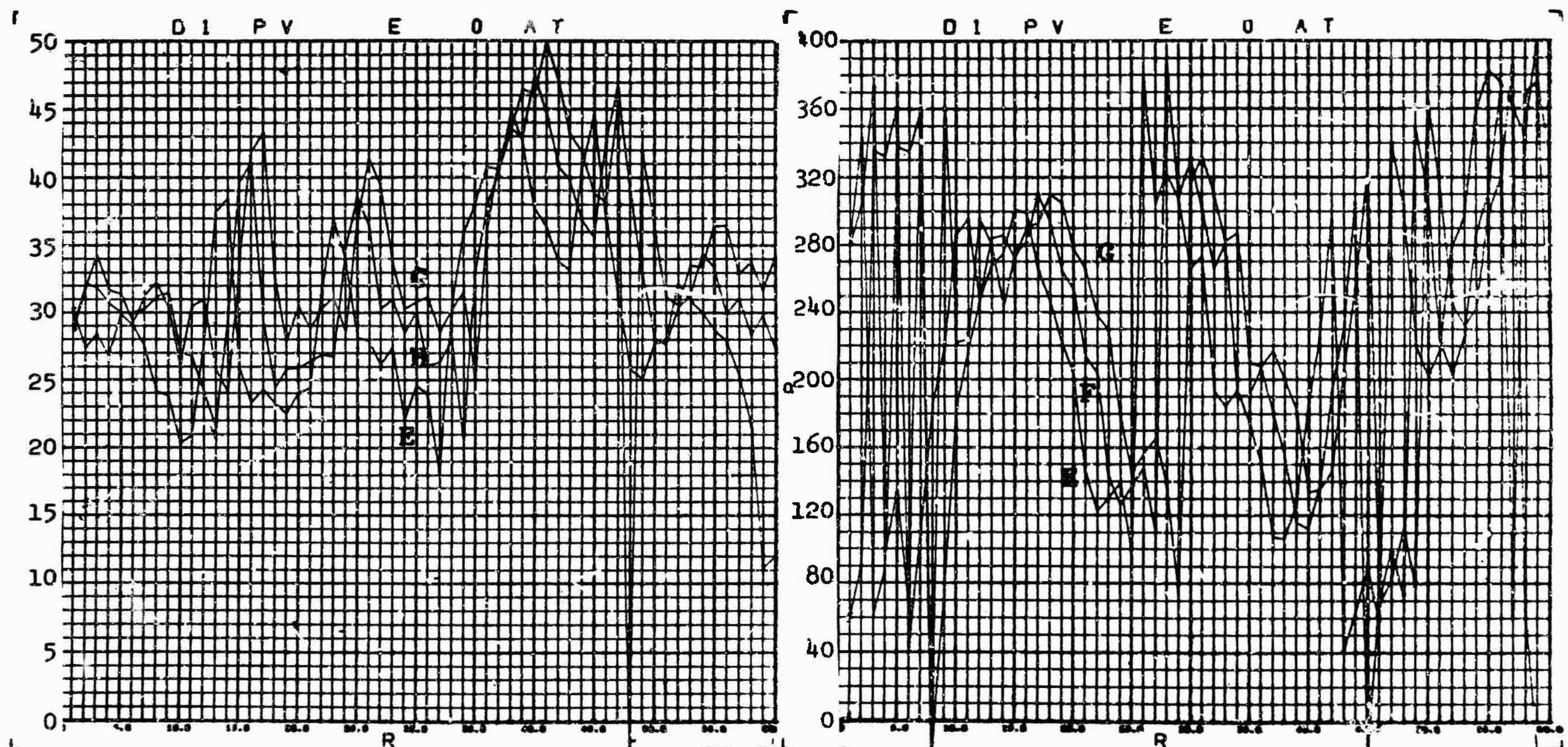


Fig. 43 PLOTTED DIFFERENTIAL TA (VERT POL, E-20)



9 dBsm 000 ft. 90,00 t.

Fig. 44 PLOTTED MEASURED DAT TRANSMIT ANT, VERT POL, E-0)

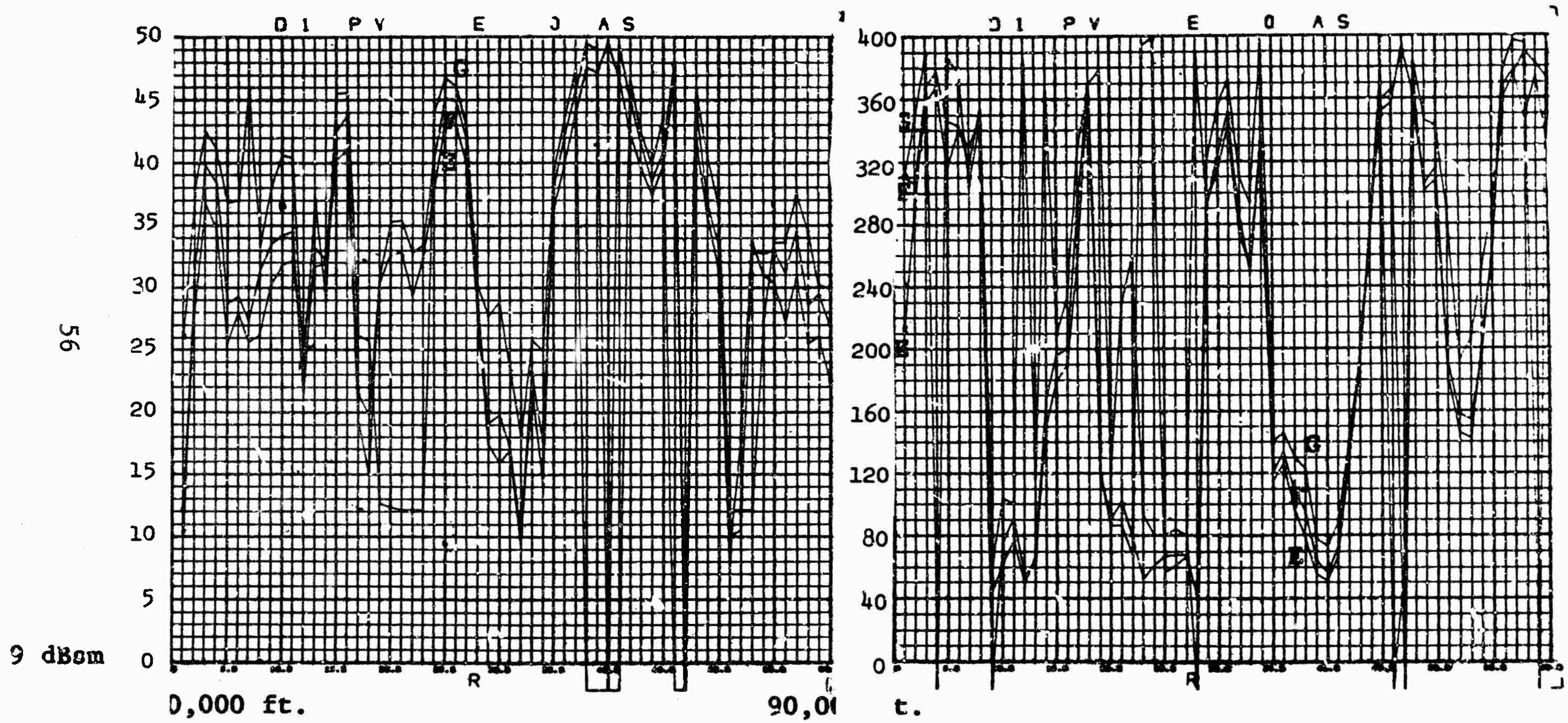


Fig. 45 PLOTTED MEASURED DATA .AVE ANT, VERT POL, E-O)

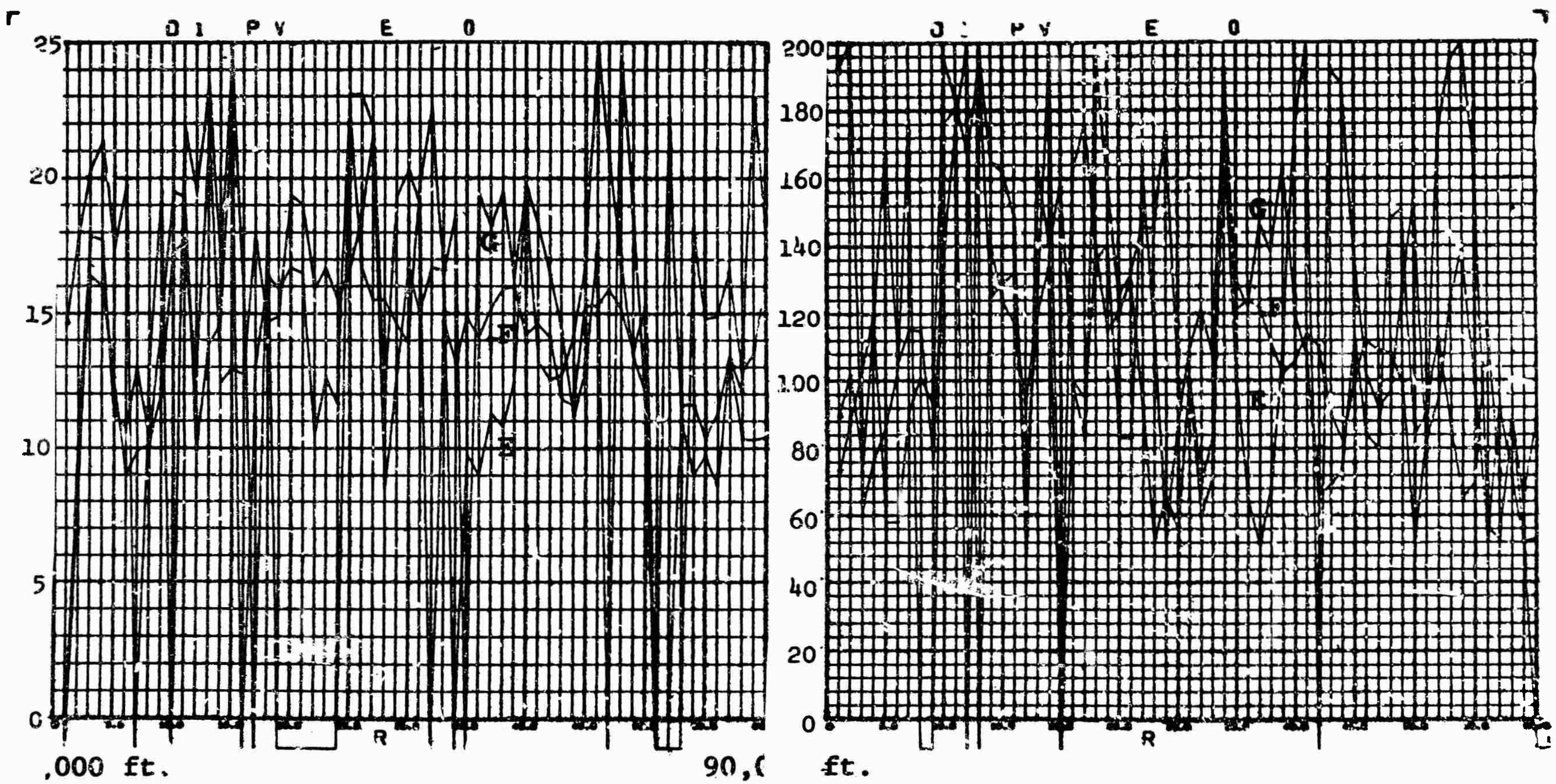


Fig. 46 PLOTTED D̶I̶FFERENTIAL D (VERT POL, E-0)

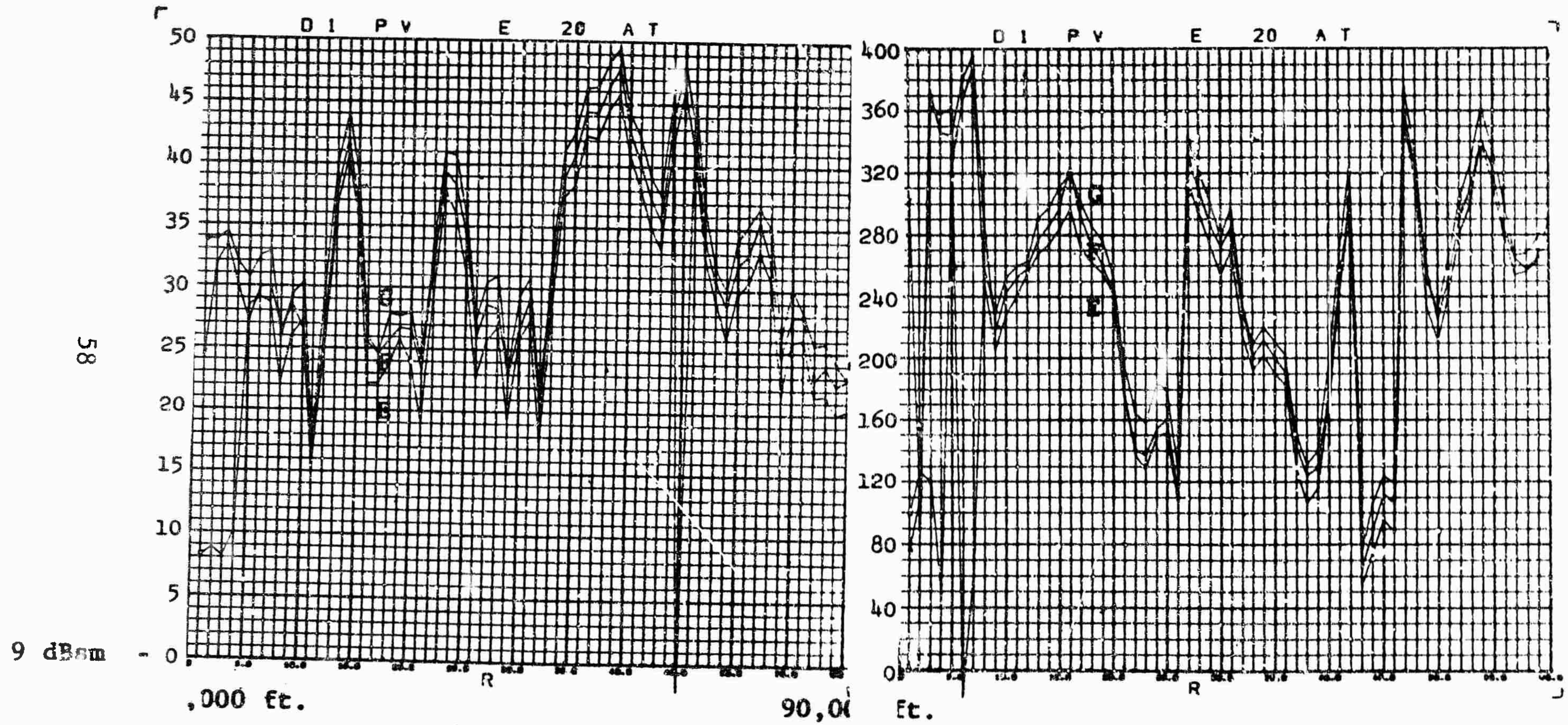


Fig. 47 PLOTTED MEASURED DATA (TRANSMIT ANT, VERT POL, E 20)

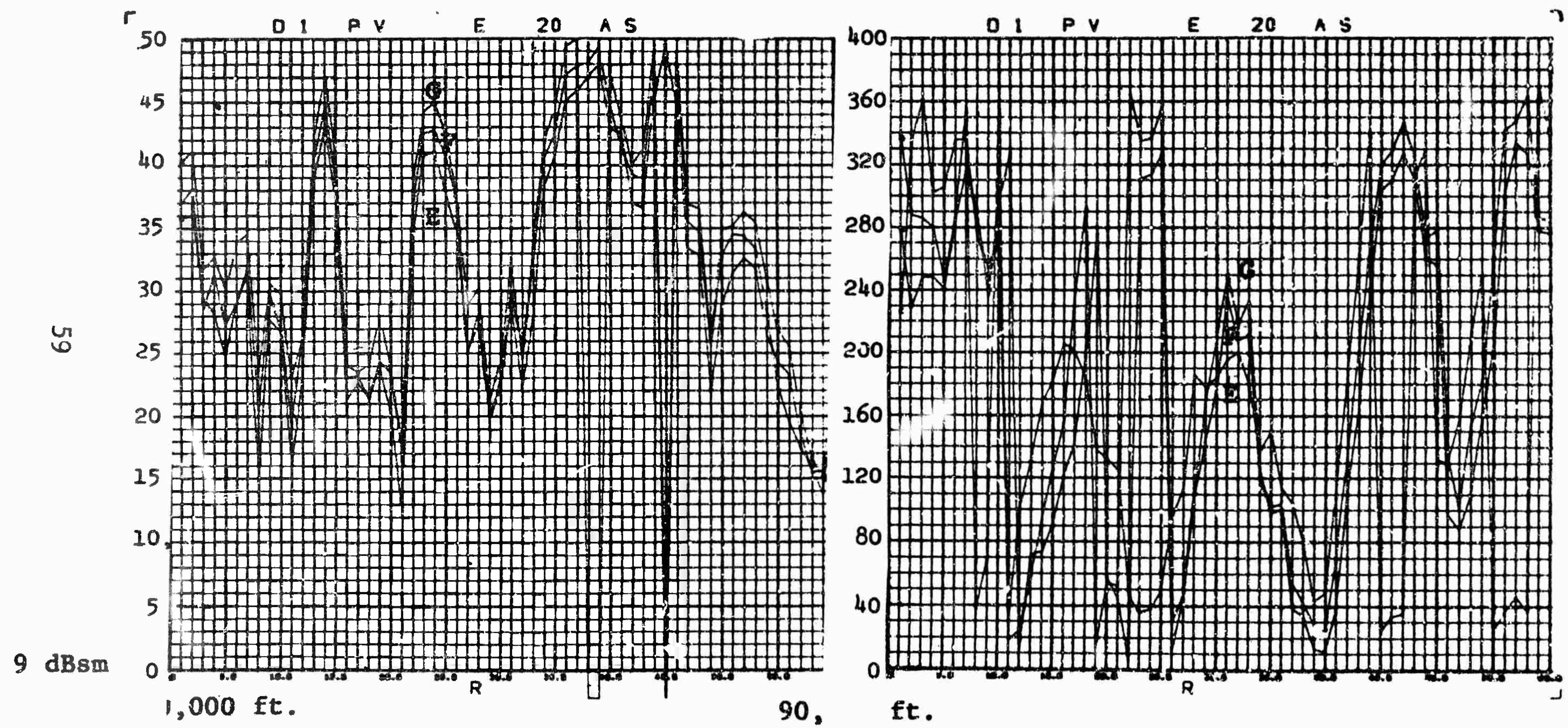


Fig. 48 PLOTTED MEASURED DA' SLAVE ANT, VERT POL, E 20)

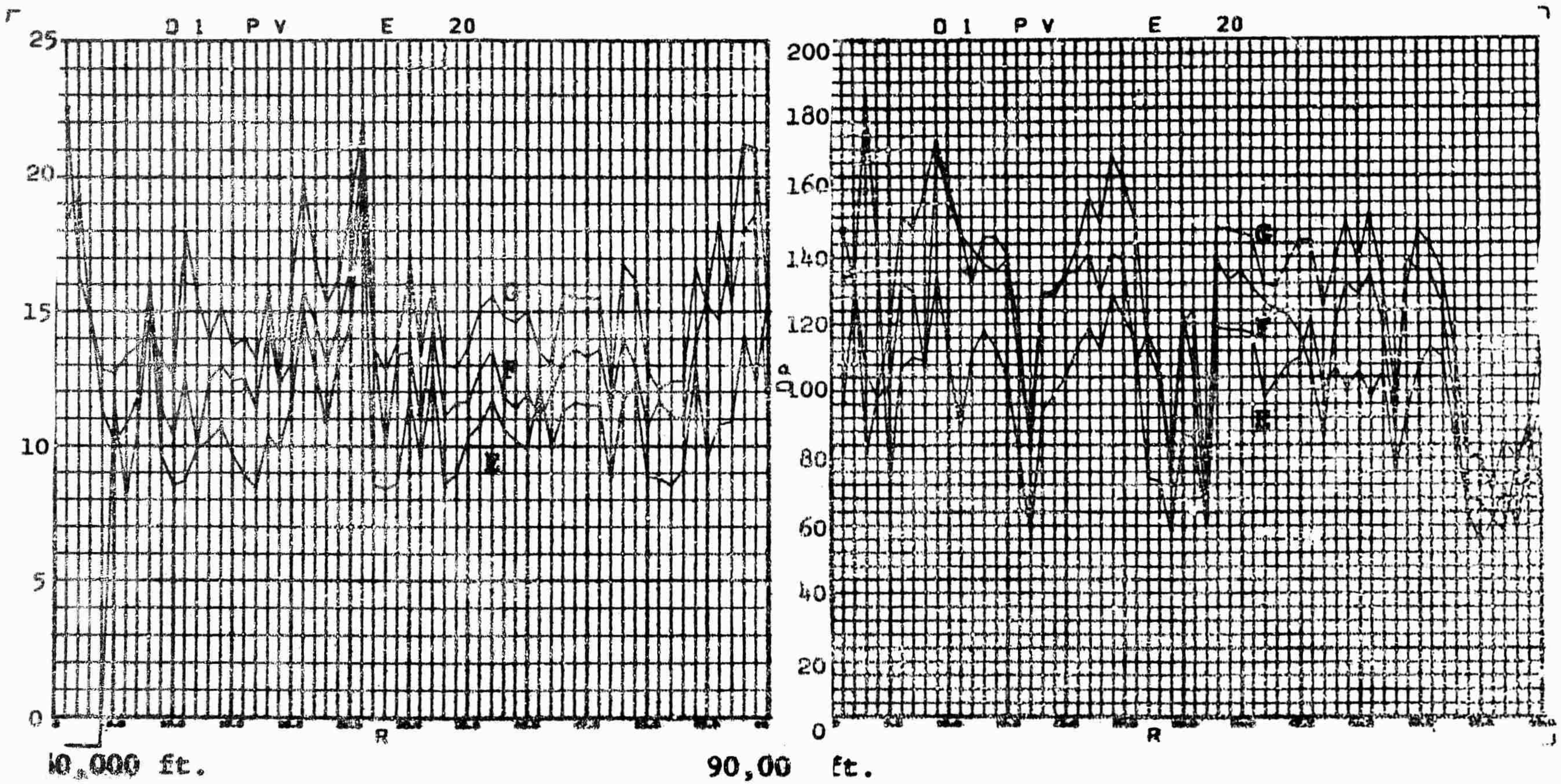


Fig. 49 PLOTTED DIFFERENTIAL DATA (VERT POL, E 20)

SECTION 3

RECOMMENDATIONS

Based on the results obtained during this program the feasibility of using a real time vector subtraction technique to significantly reduce the background return in the case of VHF and higher frequency static radars has been established.

However, in order to establish the amount of reduction which can be realized with a particular dynamic VHF system and particular background region, the rate of change of background as a function of range along with the amplitude and phase measurement time stability needs to be established. These will depend on the pulse length, operating frequency, and antenna system as well as the background scattering characteristics. Therefore, it is recommended that before the technique is implemented on a particular dynamic system a demonstration program be conducted in which the amplitude and phase of the background be recorded using an operational radar. The data obtained should then be used to establish the amount of clutter reduction which could be expected from either a real time technique or from a non-real time technique. Also, the differential return from the main lobe of the transmit antenna on the target and the side lobe of the salve antenna on the target must be established since this is also a limiting factor (see Figure 6).

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13. ABSTRACT

The material presented herein are the results obtained from a program designed to investigate the feasibility of using vector subtraction to reduce ground clutter observed by VHF radars. The program was designed to obtain measured data with which to investigate the correlation of the phases and amplitudes of the background return as received from a dual receive antenna system.

A test program was conducted at the Radar Target Scatter Site (RAT SCAT) located near Holloman AFB in New Mexico. The program was conducted with the aid of the VHF feasibility demonstration system constructed under Contract AF30(602)-3815. The tests were made using a frequency of 92.2 MHz and the background region used in the investigation consisted of a mountain range located approximately 10 miles from the site. The test results were processed using a digital computer and then analyzed relative to the degree of phase and amplitude correlation which could be expected over a significant spatial region. In addition, an implementation method for real time vector subtraction technique in the area of static cross section measurements is discussed.

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RF CANCELLATION						
VECTOR SUBTRACTION						

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